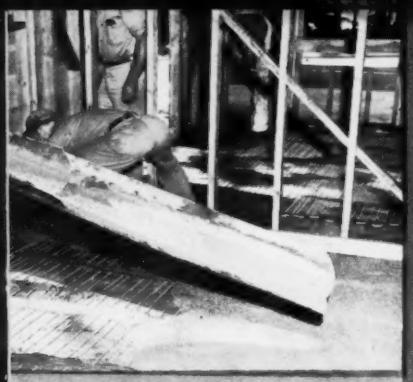

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ELECTRICAL WEST

August 1958
50 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

Electric Heat for the poolside patio

Climate Control

Thermal Factor in School Design . . . 70
What We Learned About Electric Heat . . . 72
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THIS IS YOUR GUIDE

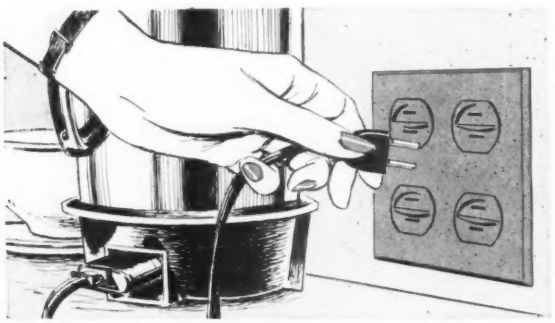
MEDALLION HOME
LIVE BETTER ELECTRICALLY

TO THESE 4 NEW-HOME GUARANTEES

It protects you from investing in a "new" home that's electrically obsolete – as 2 out of 3 houses built today are!

1. Major electric appliances already built in. They're part of the original house plan, not out-of-pocket extras – placed for maximum efficiency.

2. Provisions for proper lighting. Eye-saving lighting that is both decorative *and* functional – located where you need it.



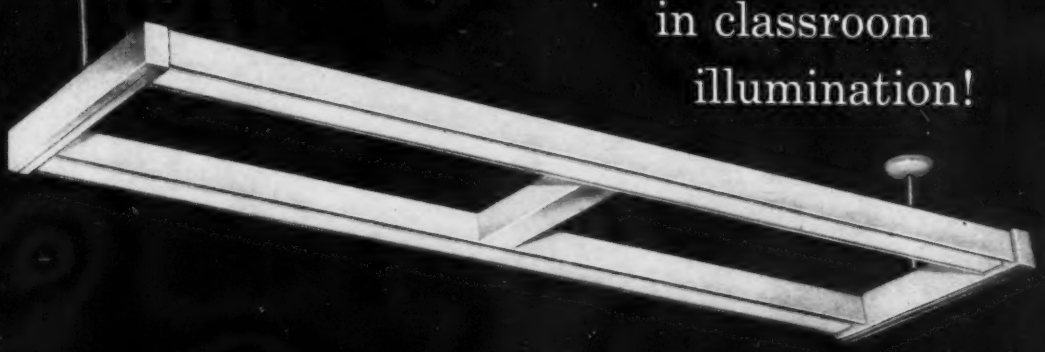
3. Ample wiring for present – and future – needs. It's in and paid for – it'll accommodate today's appliances and those you'll want tomorrow.

4. Insured resale value. Because the future is *all* electric, a Medallion Home will *remain* modern – your investment is protected.

Every Medallion Home offers these guarantees, yet need cost no more to own.
That's why it will pay you to look for the Medallion Award before you buy any home.

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER – ELECTRICALLY

PERFECT VISION... a new look in classroom illumination!



ideal for new construction or relighting jobs

Here is Smoot-Holman's incomparable new high output indirect luminaire for schools. Meets all A. S. A. requirements.

- LESS TENSION
- MORE EYE COMFORT
- DEEPER KNOWLEDGE PENETRATION

With the new 800 MA lamps, Perfect Vision will return more light—better light—per dollar than ever thought possible.

Contact your local Smoot-Holman lighting engineer or write direct for catalog PV-288 to **SMOOT-HOLMAN** INGLEWOOD, CALIF.

We support the National Lighting Bureau

service in the west and southwest for all school, commercial and industrial lighting

ELECTRICAL WEST

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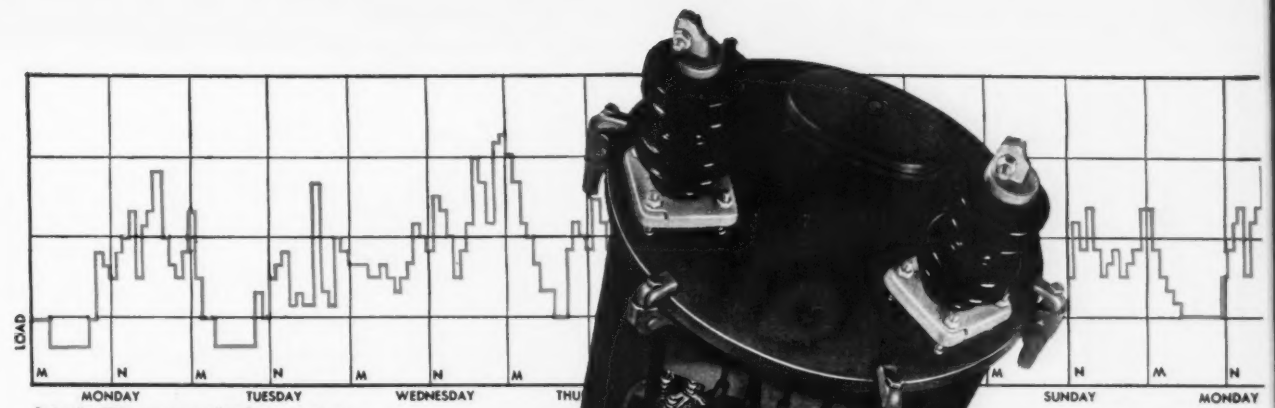


Actual utility company load curve on a transformer for an August week.

With SRT, voltage would have been kept within the band width (blue lines)

"X-ray" view of the SRT—showing the exclusive L-M regulating mechanism at the top of the Round-Wound core-coil assembly, and the under-load tap changer. SRT's will be available in the following ratings:

2400 volts, 10 through 25 kva
4160 volts, 10 through 37½ kva
4800 volts, 10 through 50 kva
7200 and 7620 volts, 10 through 75 kva
12,000, 14,000 volts, 10 through 100 kva

The SRT is another outstanding engineering development of the Thomas A. Edison Laboratories of McGraw-Edison Company.

HERE is L-M's New SRT the World's First Self-Regulating distribution Transformer

Provides regulation at the point of use; corrects overvoltage and undervoltage in four 2½% steps; improves utility company revenue and provides better service for utility customers.

By **ROBERT P. THOMPSON**
Manager of Engineering, Transformers
Line Material Industries

The new L-M Self-Regulating distribution Transformer should make an outstanding contribution to profitable, economical utility operation. By providing regulation *at the point of use*, the SRT improves revenue by avoiding loss in billings caused by *undervoltage;* and it gives customers better service by more efficient operation of lights, appliances, and all other electrical devices. By preventing *overvoltage*, it reduces burnouts of lamps and television tubes.

L-M Round-Wound Design

The SRT is basically a Round-Wound® transformer with extra taps on the *primary*, and an under-load tap changer. The voltage regulating mechanism is volt-sensitive on the *secondary*, so voltage is maintained within a 3½-volt band width centered around 120 volts.

"Adapt-A-Tap" Range Selector

The "Adapt-A-Tap" range selector provides a full 20% range within which the taps for the 10% automatic regulation may be selected—all below, straddle, or all above normal. Thus the SRT may be located anywhere on the line—at the end, in the middle, or near the substation. Four 2½% steps are provided. Operation occurs only after a time delay to prevent undesirable operation and "hunting" on switching surges and momentary voltage changes outside the band width.

More Economical Regulation

The SRT provides extremely economical regulation, *at the point of use*, and it opens wider horizons to the distribution system design engineer for more effective system planning.

Sold For Test Program

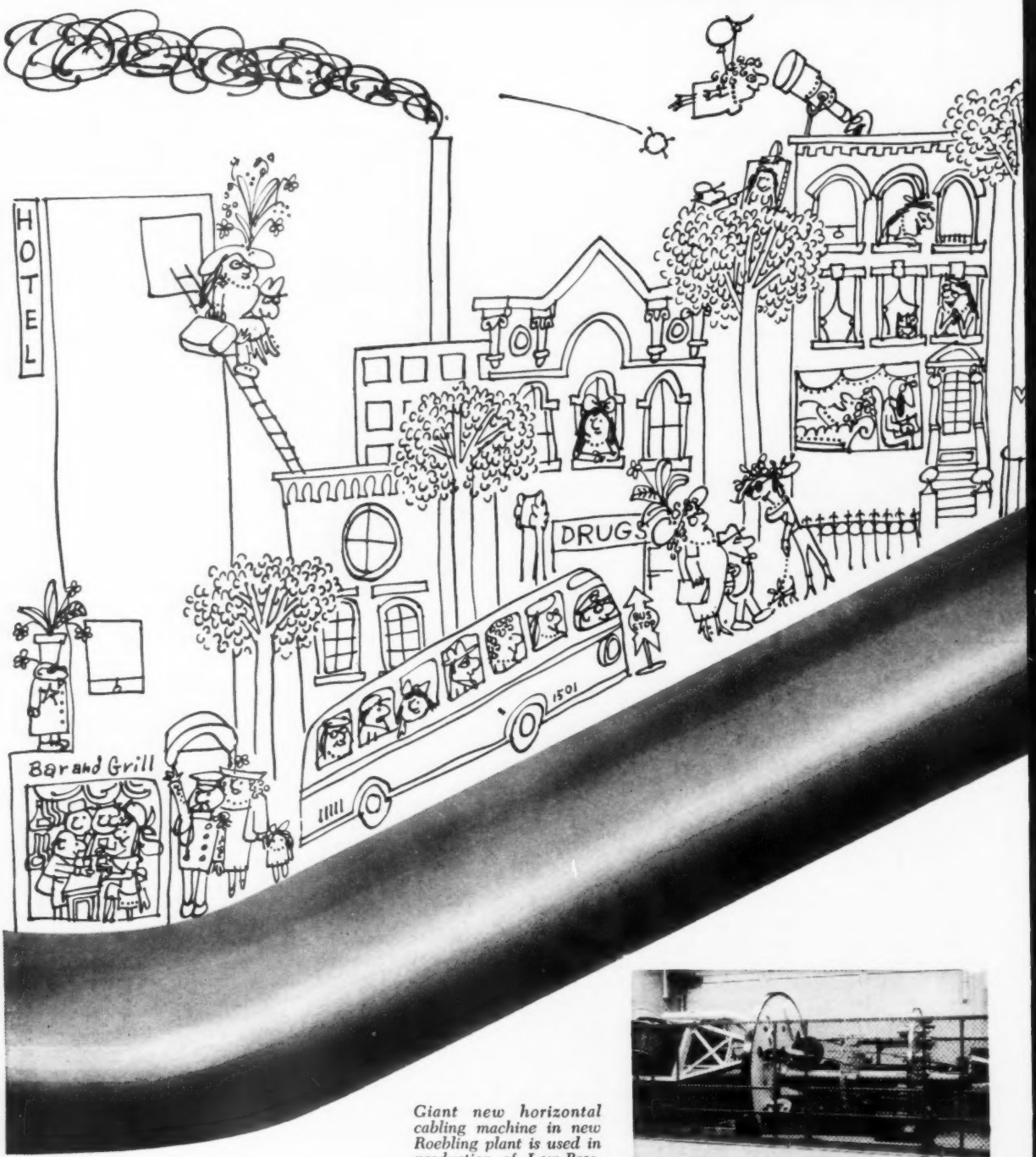
The limited initial production of SRT's will be sold to utility companies who wish to make thorough tests of the possibilities of this revolutionary new engineering development. These tests should enable utilities to determine the extent to which SRT's may be applied, and the best methods of application.

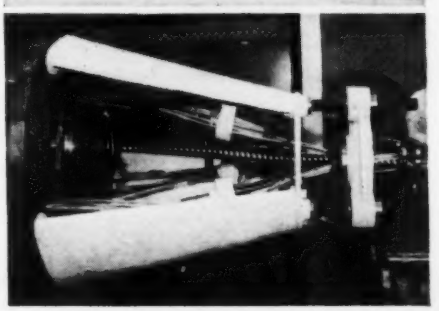
Ask The L-M Field Engineer

For details about the SRT, ask the L-M Field Engineer who calls on your company; or write A. R. Waehner, Director of Transformer Sales, Line Material Industries, Milwaukee 1.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY
Distribution Transformers

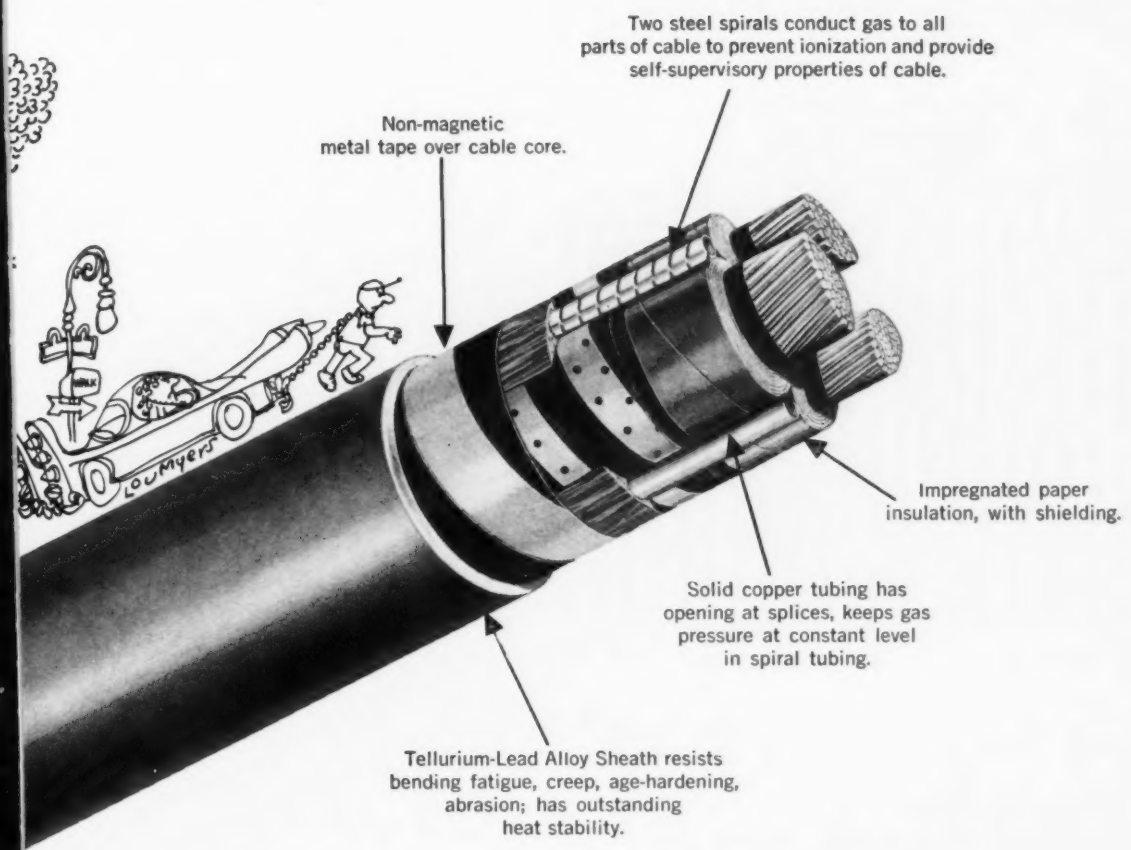
McGRAW EDISON





Giant new horizontal cabling machine in new Roebling plant is used in production of Low-Pressure Gas-Filled Cable. Here spirals, tube, insulated conductors and paper fillers are formed into cable.

LIVE BETTER ELECTRICALLY


Two steel spirals conduct gas to all parts of cable to prevent ionization and provide self-supervisory properties of cable.
Non-magnetic metal tape over cable core.
Impregnated paper insulation, with shielding.
Solid copper tubing has opening at splices, keeps gas pressure at constant level in spiral tubing.
Tellurium-Lead Alloy Sheath resists bending fatigue, creep, age-hardening, abrasion; has outstanding heat stability.
LOU MYERS

FOR **UPHILL POWER** PROBLEMS **ROEBLING GAS-FILLED CABLE!**

Packs more power in less space than solid-type cable!

When power circuit profiles include steep grades, there's no better means of power transmission than *Roebling Low-Pressure Gas-Filled Cable!* Here's why. When a solid-type cable is used for an installation of this kind, its oil impregnant inevitably drains to the bottom of the grade. Result? At the top, the cable becomes vulnerable to ionization. And oil pressure build-up at the base of the grade rapidly causes a rupture in the lead sheath, resulting in cable failure.

Roebling Low-Pressure Gas-Filled Cable (for voltages up to 46 kv) ends both these problems . . . and has other benefits besides! Dry nitrogen gas, inside the cable at approximately 12 psi pressure, effectively suppresses ionization. From the top of the grade to the bottom, internal pressure is uniform.

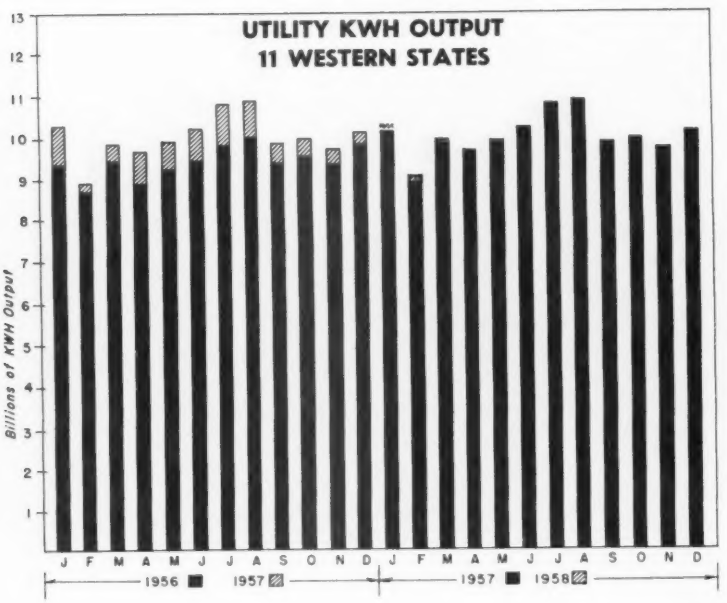
Another major advantage of Roebling Gas-Filled Cable is that it is self-supervisory. An alarm system immediately tells you if there's trouble along the line. And because this cable carries more power in a smaller diameter, existing manholes and conduits do not have to be altered.

If you have had trouble making power cable behave on grades (or anywhere else), call your Roebling Field Representative *today* about Roebling Low-Pressure Gas-Filled Cable! And for an eye-opening brochure, write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING

Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation

----How're We Doing?



Output Comparisons

Year-to-year Kwh Output Changes in Western Regions and U. S.
Per Cent Changes Over Same Week One Year Ago

Week Ending	Rocky Mountain	Pacific Southwest	Pacific Northwest	U. S. Total
May 31	+18.1	+ 5.4	− 9.9	+ 2.0
June 7	+ 8.1	− 0.4	− 9.8	+ 1.1
June 14	+ 6.8	+ 3.3	−10.5	+ 1.3
June 21	+ 5.1	+ 2.1	−11.9	− 3.2
June 28	+ 4.6	+ 0.1	−11.8	− 2.9

Better Construction Prospects

Construction awards are climbing back to their postwar rate. The sharp recovery in recent weeks has pushed the six-month total for 1958 2% above the same period last year. **June established a new record with $1.9 billion in awards** . . . In two of the West Coast major marketing areas, home building activity boosts optimism for the 1958 total. In Los Angeles the seasonably adjusted rate was running 5% ahead of the 1957 figure. In the San Francisco Bay area the number of new dwellings authorized in June was the biggest in 2½ years and the fourth successive monthly increase . . . McGraw-Hill's *Engineering News-Record* characterizes the construction upsurge as "taking on boom proportions."

The newest state, Alaska, likewise apparently is jumping the gun on new construction. **Already over $49,000,000 worth of heavy construction contracts have been awarded in 1958** and prospects are that the annual rate will exceed $100,000,000. Part of the projected new construction consists of a $1,000,000 transmission line for the Homer Electrical Assn. and a $1,000,000 distribution line for the Matanuska Electric Assn.

Retail sales look better in the hard goods area. Inventories of appliances are at an all-time low and General Electric Appliance Park reported a better June in '58 than in '57. **Consumer incomes as of August are crowding the all-time high**—despite the unemployment situation which was swelled by June graduates and students looking for summer jobs. **Even auto sales perked up slightly,** although observers in Detroit comment that 1958 has been written off as a poor sales year and new models are expected to give a shot in the arm to durable goods.

Construction Highlights

Conrad Hilton office building, $30,000,000, adjacent to $20,000,000 hotel, San Francisco, Calif.

Three new buildings at Chaffey Junior College, Alta Loma, Calif., $1,250,000.

Shopping centers at Seattle and Spokane, Wash., $1,000,000 and $3,000,000. At Littleton, Colo., $1,000,000.

Seven-level, self-parking garage, Oakland, Calif., $1,600,000.

Remodeling of commercial building, Fresno, Calif., $1,000,000.

Ten-story motel-hotel, Seattle, Wash., $4,000,000.

Residential development addition, Northern California Presbyterian Homes, Palo Alto, Calif., $3,500,000.

Housing development, Adams City, Colo., $4,000,000.

Farmers Market, San Diego, Calif., $6,000,000.

Three-story recreation center, Denver, Colo., $1,500,000.

County office building, Redwood City, Calif., $1,750,000.

Housing development project, near Honolulu, T. H., $100,000,000.

International Airport, San Francisco, Calif., expansion program, including new terminals and garage, $10,000,000.

Unit of three apartment buildings, office building and shopping center, Los Angeles, Calif., $14,000,000.

Housing at Norton Air Force Base, San Bernardino, Calif., $4,500,000.

Hospital, 300-bed, at Milwaukie, Ore., $2,500,000.

Eastman Kodak Co. factory at Whittier, Calif., $2,000,000.

Buildings for a new experimental facility, National Reactor Testing Station, Arco, Idaho, $3,000,000.

Earth Science building on campus of University of California, Berkeley, Calif., $3,800,000.

Eight-story addition, Claremont Hotel, Berkeley, Calif., $2,000,000.

Junior College, Pasadena, Calif., $5,000,000.

Two-story hospital addition, Sterling, Colo., $1,250,000.

South San Francisco, Calif., voted bonds for school construction, $2,500,000; Fontana, Calif., $1,675,000; Glendale, Calif., $11,000,000; Corning, Calif., $1,615,000; Littleton, Colo., $2,000,000; Modesto, Calif., $4,290,000; Olympia, Wash., $2,330,000; Seattle, Wash., $1,900,000; Riverton, Wyo., $1,100,000; Pasadena, Calif., $8,000,000.

Two buildings, Fullerton Junior College, Fullerton, Calif., $750,000.

Your jobs will shape up faster with Rome's easy-bending rigid conduit

A lot of time can be lost trying to form rigid conduit that's hard to bend. Now *you* can cut down on bending time—and get more *accurate* bends—with Rome's easy-bending rigid conduit.

Easy to bend, consistently uniform
Each length of conduit is uniformly annealed in a controlled-temperature furnace. By annealing, Rome can assure you of just the right degree of hardness and ductility for easy bending. Rome's rigid conduit is the *only* conduit that is control-annealed specifically for conduit use.

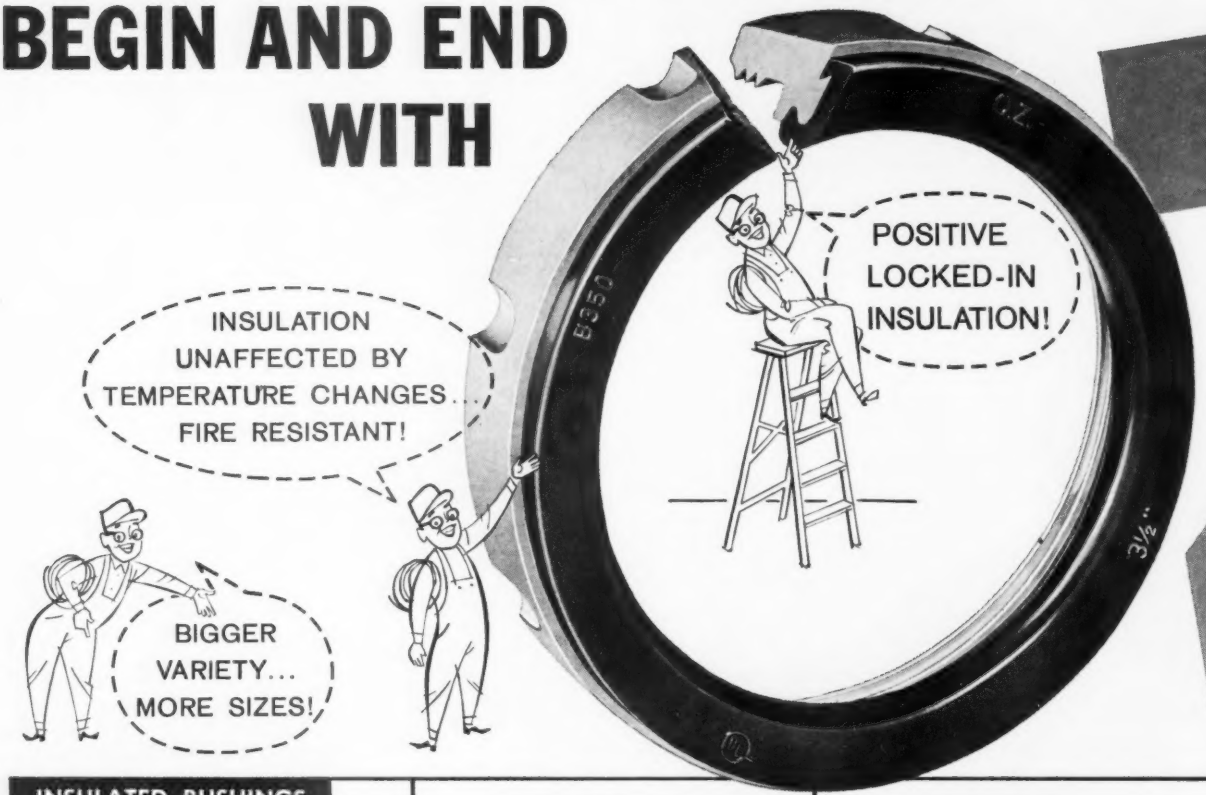
No chipping or flaking
To give you conduit with galvanizing that won't chip or flake on bending, every piece of conduit is flame washed, inside and outside, to remove all foreign matter before hot-dip galvanizing. Because an annealing process follows the flame washing, Rome's rigid conduit enters the zinc bath at the same temperature as the zinc . . . the result is a controlled alloying action that provides a tightly bonded heavy ductile zinc coating.

Quick, easy identification
You can pick out the Rome rigid conduit you need at a glance because the steel thread protectors are color-coded. In addition to the color coding, the ½" to 2" size protectors have the conduit size printed right on the face. These thread protectors may also be used to cover stub-ups, providing adequate protection to the threads.

Use Rome's easy-bending rigid conduit on your next job. Contact your nearest Rome representative for more information—or write to Department 949, Rome Cable Corporation, Torrance, California.

ROME CABLE
CORPORATION

THE FINEST CONDUIT RUNS BEGIN AND END WITH



INSULATED BUSHINGS

1 Type "B" — Designed for prevention of grounds. Made of highest grade malleable iron or steel, insulated with Bakelite molded and locked into bushing. Sizes: ½" to 6".

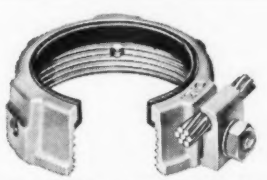
2 Type "AB" — New addition to the O.Z. line . . . made of high-strength aluminum alloy with interlocked Bakelite insulation. Sizes ½" to 6".

3 Type "BL" — Combines protection of insulated bushing and means for making quick, positive ground connections. Consists of Type "B" equipped with combination lug. Sizes: ½" to 6".

7 Type "E" — For spacing and individually insulating wires as they emerge from conduit. Molded canvas Bakelite covers have high dielectric and mechanical strength. Sizes: ½" to 6".

GROUNDING BUSHINGS

8 Type "GB" — Corrosion-resistant bronze. Ideal for grounding banks of conduit where metallic-protected cable is used. Sizes: ½" to 6".



9 Type "IGB" — Similar to "GB" except insulated with Bakelite collar locked into bushing. Sizes: ½" to 6".

Z bushings

O.Z. holds the line on quality — with the line that gives you greatest selection!

Whatever your bushing requirements, O.Z. has the type and size you need! As with all O.Z. products, *completeness* is the keynote! And, as always, this completeness is backed by another O.Z. constant: *quality!* O.Z. bushings utilize only the traditionally-superior materials: Cadmium-plated or hot-dip galvanized iron and steel, bronze, and molded canvas Bakelite . . . all at prices competitive with substitute materials . . . all time-proven in finer conduit runs everywhere. For more information on O.Z. bushings, call your local O.Z. distributor or write direct to the company.

4 Type "SB" — For use on conduit having no threads. Case-hardened cup-point set screws for fastening. Sizes: ½" to 6".

5 Type "SBT"—A cadmium-plated bushing for thin-wall conduit application. Fastens with case-hardened, cup-point set screws. Sizes: ½" to 2".

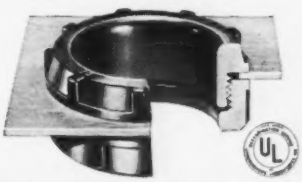
END BUSHINGS

6 Type "EL" — Provides the protection of end fittings and permits quick, positive ground connection by means of combination lug. Sizes: ½" to 6".

INSULATING BUSHINGS

10 Type "A" — Made of molded canvas Bakelite having high dielectric and mechanical strength. Sizes: ½" to 6".

11 Type "BB" — Molded Bakelite. Male thread. Installed with locknut. Insulates cables passing through metal boxes or troughs. Sizes ½" to 6".



12 Type "ABB" — Combination of Type "A" and "BB" bushings to insulate cables passing through metal boxes or troughs. Sizes: ½" to 6".

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

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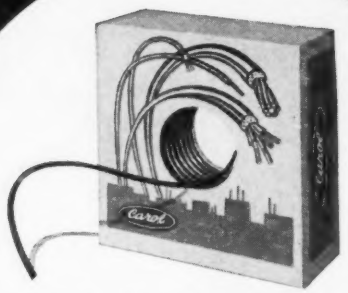
- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- CONDUIT FITTINGS
- INTERLOCKED ARMOR CABLE FITTINGS

Carol 18 and 16 gauge S & SJ wire, portable cord and heater cord . . . one 250 ft. spool per carton. Easier handling, storing, inventory control.



Sturdy, quick-opening, self-dispensing carton for 14, 12 and 10 gauge portable cords. Exclusive Inventory Keeper minimizes waste. 250 feet per carton.

"No-charge" Plywood Reels for 14, 12 and 10 gauge portable cord. 500 or 1000 feet per reel.

Lamp Cord and Thermostat Cord packed four 250 ft. spools per carton. Keeps weight to a practical limit for easier storing and handling. Cartons can be used for reshipment.

Packaging with a Pay-off

WHEN YOU CALL FOR CABLE, CALL FOR . . .

Carol®

Carol *planned* packaging pays off in three ways: (1) Easy-to-read color-coded labeling lets you spot the cable you want at a glance. (2) Extra sturdy, easy stacking, quick opening, self-dispensing. (3) Handy Inventory Keeper minimizes waste.

Take advantage of the packaging pay-off you get with top quality Carol Cable.

CAROL CABLE COMPANY

Division of the Crescent Co., Inc., Pawtucket, R.I.

EW news roundup

INFLATION NOTE—France was held up as the horrible example of what happens when inflation runs rampant. A chamber of commerce official commented that, while serving as a U.S. Army captain in France during 1918, his pay of $200 a month was exchanged for 1,000 francs at that time. Today 200 American dollars would buy 84,000 francs. If the equivalent depreciation had happened to the U.S. dollar it would have lost 83/84th of its value and the lowest price car would cost about a quarter of a million dollars. A $100 Social Security check would buy two pounds of hamburger. A $100,000 life insurance policy would keep a widow in a second-class boarding house for about ten months.

It only took 30 years for that to happen to the French currency; it's food for thought considering what's happened to the U.S. dollar in the past 15.

—EW—

Early response to the AIEE's plan to inaugurate an educational course on industrial distribution systems shows enthusiastic support. The course, based on the Industrial Power Systems Committee Red Book, will attempt to reach people involved in design, operation and maintenance of industrial and commercial electrical systems.

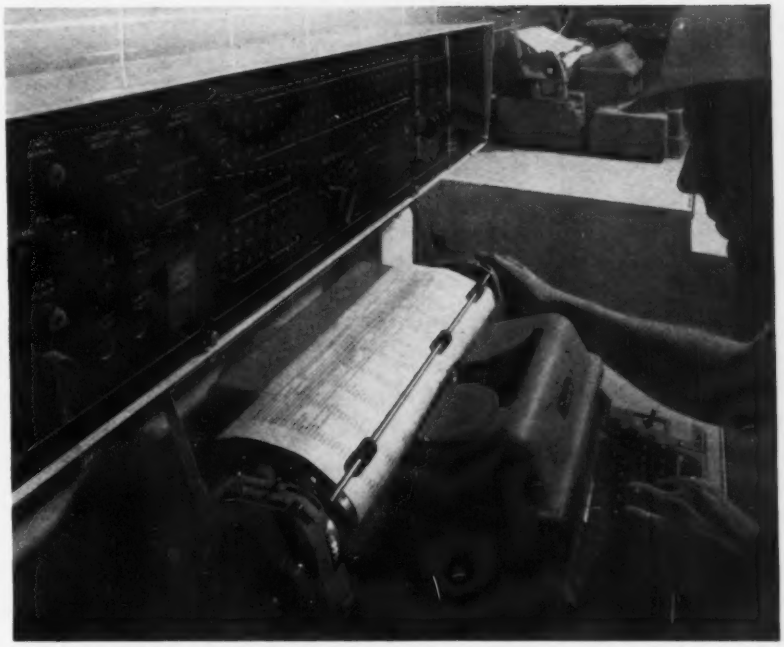
—EW—

THIN PICKINGS—Recent REA loans in the West indicate that the unserved farm customers are on the outermost fringes of service areas. In Montana, the Tongue River Electric Cooperative is building 225 miles of distribution line to serve 115 new rural consumers; the Golden West Electric Cooperative is building 13 miles of line to serve 22 new customers. The Ravalli County Electric Cooperative is putting up 26 miles of distribution to serve 57 new customers.

Lower Valley Power & Light Inc., a Wyoming cooperative, will construct 105 miles of line to serve 118 new customers. These new lines average barely over one customer per mile but the value of the service to the remote farms can't be measured by conventional economics.

—EW—

MASS PRODUCTION – Nuclear fuel elements are now being produced in typical American fashion, by mass production, at the General Electric Atomic Power Equipment Department. First units to go through the production line were the 488 rod-type assemblies which will be needed for the Dresden atomic station near Chicago. Each unit, 11 ft long, will contain 144 smaller fuel rod segments containing pellets of sintered uranium dioxide. The completed core will contain about 60 tons of uranium that has an expanded fuel life of 3.5 years. A coal-fired generating plant of the same size would burn 3,600,000 tons of fuel during that same period.



Station readings are automatically printed, not read, in new steam plant control room

LOOK! NO DIALS TO READ—This first transistorized general purpose digital computer gives an automatic record of steam plant operating conditions without the necessity of reading dials or recorders at the new 210,000-kw unit at Sterlington steam station of the Louisiana Power & Light Co.

The control room is devoid of most of the usual array of dials, gages and recorders. Instead there are the cabinets housing the computer and the control console and printers.

Developed by the Daystrom Systems Division, La Jolla, Calif., the new Operational Information System handles 350 measuring points for temperatures, flows, pressures, heat rates and various electrical measurements and it will also print at regular time intervals 100 plant readings necessary for accounting and trouble-shooting records.

Louisiana Power & Light engineers state that the equipment was not installed to save manpower but primarily to provide operating expe-

have your

Westinghouse representative

tell you how you can

CHANGE OUT A

DISTRIBUTION

TRANSFORMER

AT THE BREAK-EVEN POINT

Now—an indication to show when the loading on a pole-type distribution transformer has reached economical change-out point on conventional or protected units . . . Another answer to meet a changing need—made possible because Plowback of earnings into research maintains Westinghouse leadership in distribution transformer development.

J-70847

YOU CAN BE SURE...IF IT'S

Westinghouse

rience with the type of equipment that will eventually be used in the completely automatic power plant, wherein a continuous computer scanner will take over start-up, operation and shutdown without human supervision.

—EW—

Well aware of the "heavy" nature of some subjects in electronics, the technical program committee of the WESCON Show, scheduled for this month in Los Angeles, has sent a pamphlet entitled "Techniques for Better Talks at WESCON" to more than 200 speakers who will appear on the program. Among other things, the speakers are encouraged to talk about their papers instead of from them.

—EW—

HOME LIGHTING SPUR—A new course to train residential lighting sales people is now available through the Academy of Lighting Arts. An outgrowth of G-E's Nela Park research studies, the new training course is a noncommercial program designed to fill the training needs of industry segments interested in promoting home lighting. It consists of color slides, motion pictures and other visual aids together with text material for 12 two-hour sessions. The complete package costs $2,500 with a possibility of re-using all material in repeated courses with the

Thurle Thornton is the man who makes those aluminum pole identification tags that you are probably using. Thornton lost the use of both legs because of an old spinal injury incurred when he was a star halfback with the University of Washington varsity team in 1929. With the help of M. D. Parrett, manager of Shelton, (Wash.) PUD, Thornton started the business of making the aluminum tags. "Thur-Max" is the trade name, and 7459 Gatewood Road in Seattle is the address.

exception of text material passed out to the individual student. It is anticipated that the initial cost will be amortized by fees charged.

—EW—

Gene O'Fallon, owner of O'Fallon & Sons in Denver, has what he calls "the prettiest automobile in all Denver." The mobile beauty is an exact replica of a 1901 Oldsmobile, which O'Fallon uses for delivery of the Ling TV cameras that he leases. The car actually is new—made by a firm at Ft. Lauderdale, Fla.

—EW—

HONORED — Congratulations to John M. Nelson, executive assistant superintendent, Seattle City Light, on his election to vice-president in the AIEE, and to Eugene C. Starr, chief engineer, Bonneville Power Administration, on his election to the board of directors.

Congratulations also to four eminent Western engineers on their election to the grade of Fellow in the AIEE: Richard F. Stevens, Bonneville Power Administration; Edgar Kanouse, Los Angeles Department of Water & Power; Harry Lott, Southern California Edison Co.; and William B. Loper, California Electric Power Co.

DIFFERENCE OF OPINION — A recent survey conducted by the Du Pont Co. presumably exploded the popular image of the scientist as a "square" or antisocial hermit. The survey indicated that the typical American scientist is a family man, interested in religious, social and civic affairs, with a healthy mixture of sports activities and hobbies. In contrast to the Du Pont survey, findings have been released by Columbia University which hold that the scientist is introverted, shows asocial tendencies, has strong leadership drives, and isn't conscious of his motivating forces. Then, to make matters worse, Columbia reports that he has late psychosexual development.

Engineers fared considerably better. They are found to have personality traits that lead to success in most other fields. These include tact, interest, initiative, leadership, dependability and energy. The report goes on to say that engineers are stable, self-sufficient, socially conforming, impersonal, introverted individuals—casual but competent socially. Take your choice!

—EW—

As it had decreed 10 years ago, Los Angeles Department of Water & Power pulled the switch at midnight June 30 tak-

Handling Employee Grievances

. . . is a big part of supervision. How do you score?

	True	False
1. People are more likely to criticize than to compliment.	.....	.....
2. An understanding of the mass mind is necessary in dealing with people.	.....	.....
3. One of the major crosses of supervision is hearing out employees.	.....	.....
4. All grievances should be accepted at face value.	.....	.....
5. Complaints about any one situation generally have their roots in a deeper grievance.	.....	.....
6. If you agree with a complainer you will be besieged with malcontents.	.....	.....
7. Good employees never complain.	.....	.....
8. Dealing with subordinates as individuals breaks down the barriers of management.	.....	.....
9. Complaints are based more on emotion than on reason.	.....	.....
10. If you make people "feel" right, complaints seldom occur.	.....	.....
11. Self-control is more important than brainpower in dealing with grievances.	.....	.....
12. Many grievances can be solved by letting the employee "talk out" his problem.	.....	.....

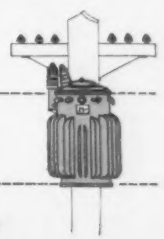
(Answers on page 94)

Now . . .
increase distribution transformer life without additional investment . . .

INSULDUR . . .
THE ALL-NEW
WESTINGHOUSE
INSULATING
SYSTEM

Have your Westinghouse representative tell you about Insuldur . . . another answer to changing needs.

J-70850



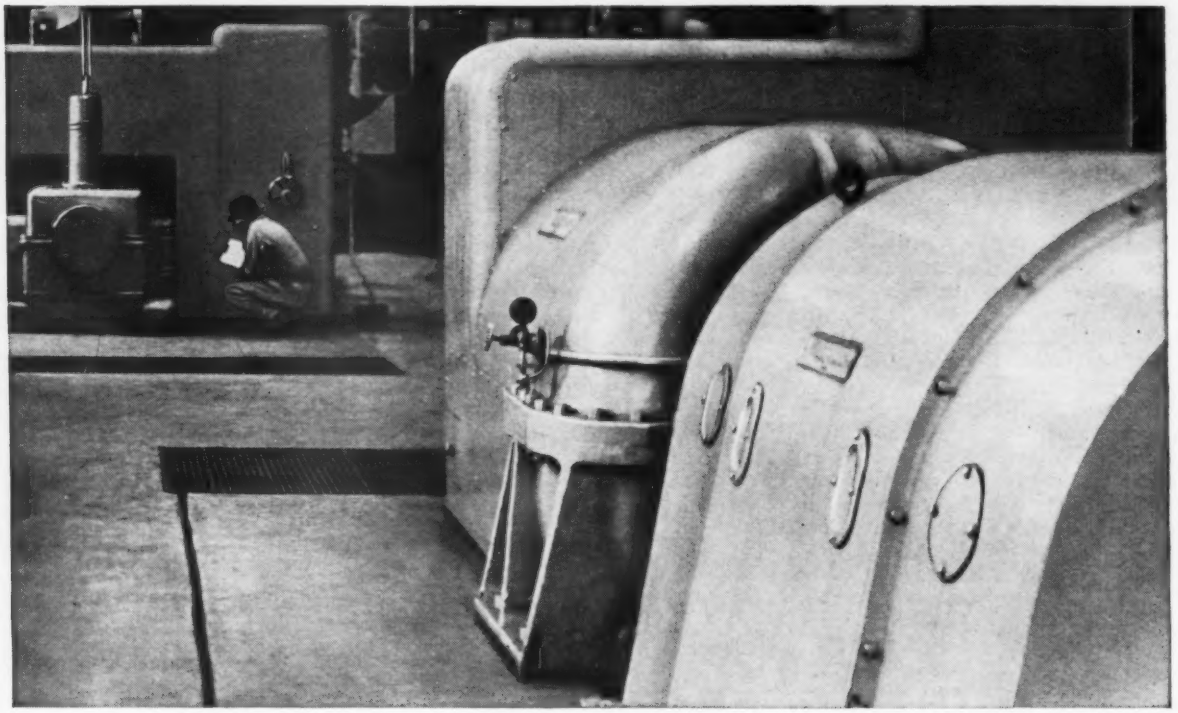
YOU CAN BE SURE...IF IT'S
Westinghouse

STANDARD ENGINEER'S FIELD REPORT

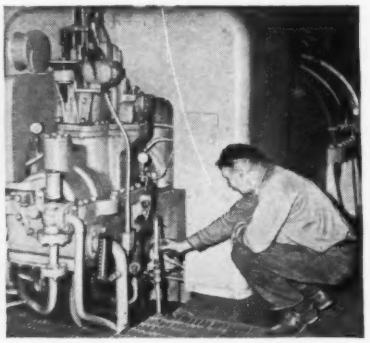
PRODUCT CHEVRON OC TURBINE OIL

FIRM Southern Utah Power Co. Cedar City, Utah

After 70,918 hours, Oil Neutralization No. only .01!

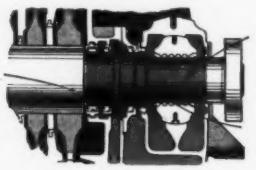


Latest analysis of Chevron OC Turbine Oil in these two Westinghouse steam turbines at Southern Utah Power Co. shows oil to be in virtually new condition. Neutralization number was just .01, and all other characteristics measured were equally satisfactory. At time of sampling, 2,500 KW turbine (in foreground) had run 70,918 hours, 5,000 KW unit (at rear) 31,670 hours. Neither unit has required sweetening since initial charge of Chevron OC Turbine Oil (formerly called Calol OC Turbine Oil).



Steam Plant Superintendent Ralph Jones (left) explains how changes in load automatically control boiler's induced draft fan through this fluid coupling. Chevron OC Turbine Oil has given excellent service as hydraulic fluid in this coupling. At right, Mr. Jones checks oil temperature on smaller turbine. This unit went into service in 1945, the larger one in 1951.

Why Chevron OC Turbine Oil prevents sludging, rusting and wear



- Excellent metal wetting ability keeps oil on bearings and gears under heaviest loads
- Oxidation inhibitor prevents sludge, gum and lacquer formations
- Corrosion inhibitor prevents rusting

For More Information contact your Standard Engineer or Representative, or write 225 Bush Street, San Francisco 20, California

CHEVRON

TRADEMARKS "CHEVRON" AND CHEVRON DESIGN REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA

ing its last d-c generator out of service. A 550-v system had been taken out of service five years ago, and only three customers were on the 220-v system when the cutoff came. The Department had arranged a program of reimbursement to help customers defray the cost of converting to a-c.

—EW—

SHOCKER—"Code enforced waste is now costing U. S. home buyers at least $1 billion a year." This is a statement of *House & Home* magazine after sponsoring a round-table discussion on building codes by 68 building officials, builders, architects, prefabricators, mortgage lenders, realtors and materials men.

First on the list of 10 common wasteful code requirements is:

"Wiring installation more costly than nonmetallic sheathed cable (Romex) which is just as good and much cheaper than armored cable (Bx), knob and tube, flexible conduit, or rigid conduit."

The panel of experts figured that lack of a uniform building code across the country costs the purchasers about $1,000 a house. It is suggested in the *House & Home* report that this money would buy year-round air conditioning plus complete thermal insulation, or perhaps

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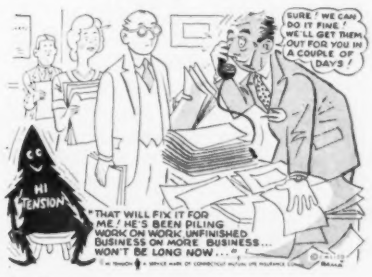
Get Off the Worry-Go-Round


SURE! WE CAN DO IT FINE! WE'LL GET THEM OUT FOR YOU IN A COUPLE OF DAYS!
HI TENSION
"THAT WILL FIX IT FOR ME! HE'S BEEN PILING WORK ON WORK UNFINISHED BUSINESS ON MORE BUSINESS... WON'T BE LONG NOW..."

Yes Man!

Good old Joe! He can't say "no." There's one in every office. Everybody takes advantage of him. Then suddenly Joe has a heart attack. He's away from the office for three or four months. Yet the business goes on.

If there is a Joe in your office, show him this example of how HiTension can slowly build up such pressure that something has to give. If it hurts Joe's feelings to realize that no one is indispensable, he'll get over it. But he may never get over the damage he inflicts on himself by taking on more than he can handle.

Joe must learn to say "no." He can't take on everything.

PROTECTION AND BEAUTY, TOO

There's No Other Paint Like Subox

...**Because** Subox is the only paint in the United States made with chemically-active lead-suboxide. Unlike the pigments of inert paints, lead-suboxide changes chemically after drying to form an increasingly tough protective coating — rust inhibitive, acid and alkali resistant. Subox effectively safeguards metal surfaces: buildings, transformers, fences.

...**Because** Subox paint comes in modern, bright pastel shades, as well as darker colors, painting for normal maintenance can produce attractive decoration appropriate for neighborhood surroundings.

...**Because** Subox covers with a dense, impervious film, a single coat often is sufficient. Subox is both economical and good looking.

Write today for technical literature and color card.

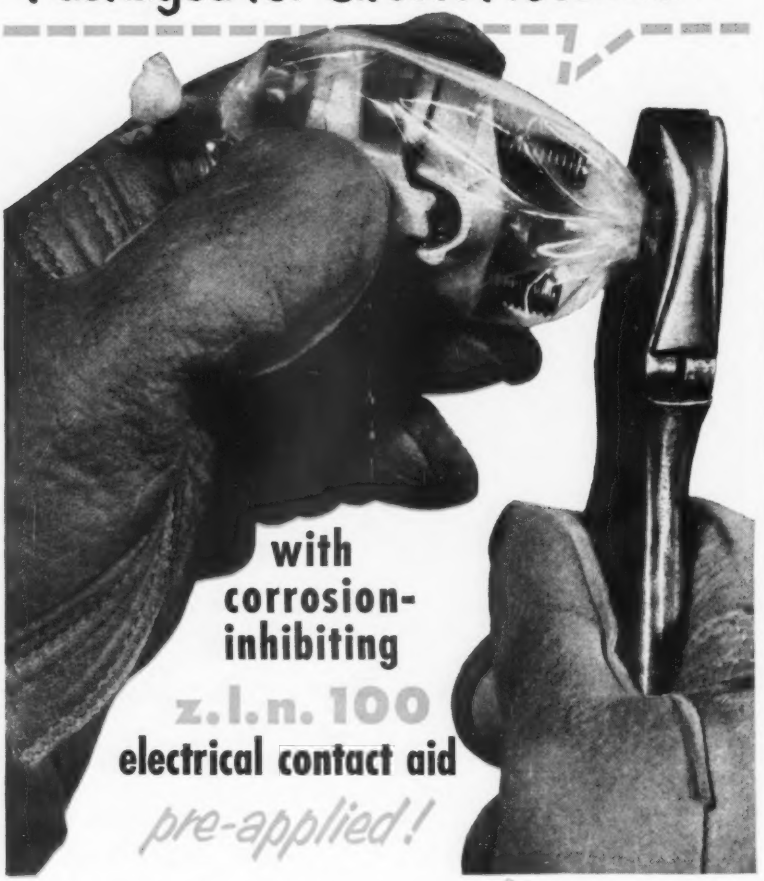
SUBOX PAINTS

Subox Inc.

Trade Mark

Established 1924
18 Fairmount Plant
Hackensack, N. J.

Packaged for Circuit Protection!



All Chance Uniclamps -Parallel Groove Clamps -U-Bolt Connectors -and Hot Tap Clamps are now available in individual plastic packages with z.l.n.100 pre-applied! Clamp stays clean . . . sealing tape reminds lineman to wire-brush and apply z.l.n.100 to the conductor too!

A·B·CHANCE COMPANY

GENERAL OFFICES: CENTRALIA, MISSOURI
(A·B·CHANCE CO. of Canada, Ltd., Toronto) CC58-9

appliances, or close to 200 sq ft more living space, or a second bath plus washer and dryer, or a choice of half a dozen other new features that would make the home much more livable.

One of the more important conclusions of the panel is that residential construction code for up to four-family dwellings should be separated from the construction code for office buildings, factories, hospitals, etc.

—EW—

A Utah Power & Light Co. lineman was listed in the company's accident prevention report. He was working on a pole and brick dust flew in to his right eye.

—EW—

COURAGEOUS — ELECTRICAL WEST hats are off to Joe Larsen of Portland General Electric's line department who rescued a woman from a burning house.

When he heard a small boy yelling for help, Larsen scrambled down off a pole ". . . and ran all the way to the house with my hooks on."

Smoke and fumes had kept other people from entering the house, but Larsen covered his face with a handkerchief and rushed in. He found Mrs. Lucille Applegate confusedly wandering in the smoke-filled house and carried her to safety.

—EW—

New address of the Industrial Electrification Council is 750 Third Ave., New York 17, N. Y.

—EW—

D. H. Osborne has been elected president of Porcelain insulator Corp. He has been with the company for 30 years, and has been a vice-president for half that time.

—EW—

PLUTONIUM PUSH—AEC has allocated $10,000,000 to the Argonne National Laboratory for the construction of a fuels technology center. The new facility will speed up and expand the effort to develop plutonium as a fuel in nuclear power reactors. Research is complicated by the fact that plutonium, a man-made element, is intensely radioactive and a strong emitter of alpha particles.

However, some scientists believe plutonium will be the most important fissionable material available primarily because it can be made in a nuclear reactor from the major isotope of uranium, U-238, which is not fissionable itself. There is 140 times more U-238 available in a ton of natural uranium than U-235, which is the conventional fissionable isotope.

—EW—

Customers of Franklin County PUD, Pasco, Wash., can have individual street lighting installations. The PUD will install a photoelectric controlled lighting unit at the request of a customer for a charge that varies from $3.50 to $4.15 a month. It solves the problem of providing general outdoor lighting for customers in areas not served by the PUD's street lighting system.

—EW—

PREDICTION—The Federal Power Commission estimates that electric utility power loads will require installations totaling 394,000,000 kw by 1980. This is almost three times the present installed capacity of 131,000,000 kw. Total energy requirements are expected to reach 1.8 trillion kwh.

—EW—

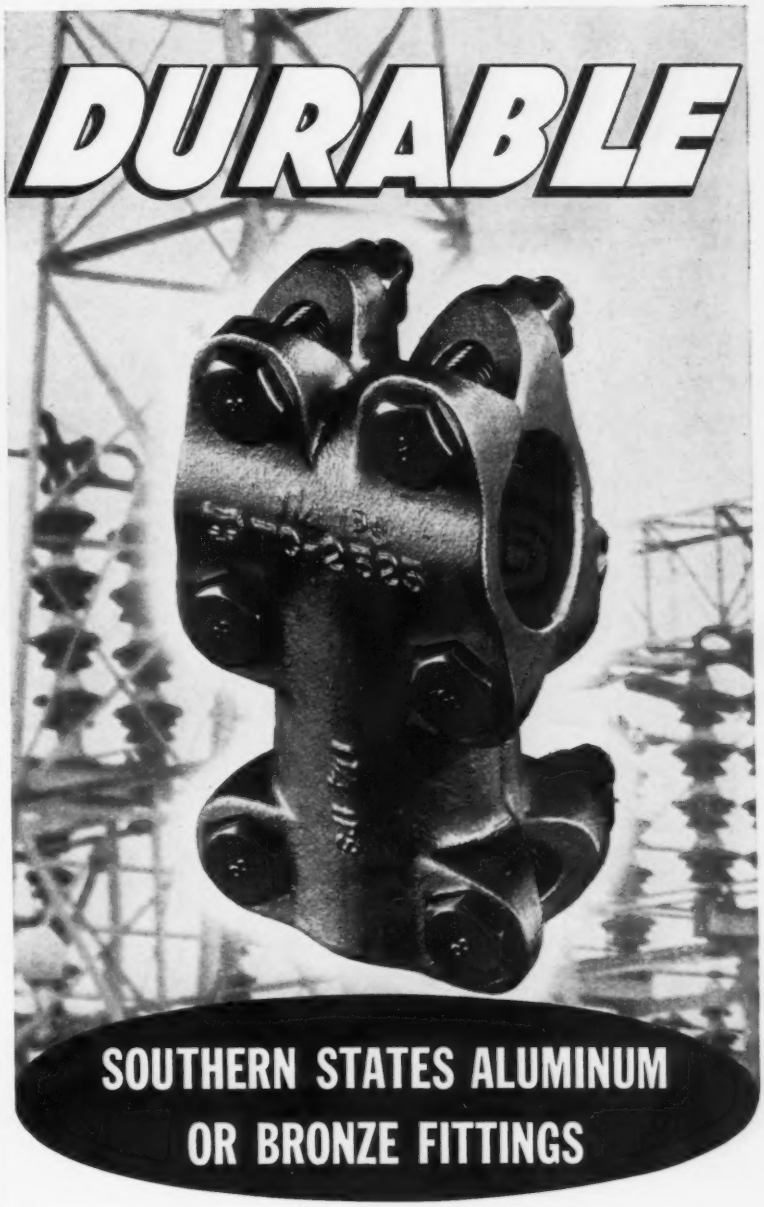
PUBLIC RELATIONS NOTE—The Public Service Co. of Colorado is remodeling 50 of its largest trucks, switching the exhaust pipes from the right side to the left side of the chassis. No longer will objectionable exhaust fumes be spewed into the path of sidewalk pedestrians as trucks pass or wait for traffic signals.

—EW—

"Solar Light Flashes" tells about the warden of a midwestern penitentiary who is still wondering about a sign he found strategically placed over the electric chair. It said simply, "You can be sure if it's Westinghouse."

—EW—

PARTING THOUGHT – Just think, if Edison hadn't invented the electric light, we'd all have to watch television by candlelight.



Knowing that fittings are often re-used, Southern States has designed its entire line with easy, on-the-job assembly and re-assembly foremost in mind. Southern States connectors and bus supports have recessed hexagonal bolts, assuring easy and rapid "one-wrench" installation or removal. Each connector fits properly, has ample strength, and is sufficiently rugged at stress points. *Never underestimate the importance of a good connection!*

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

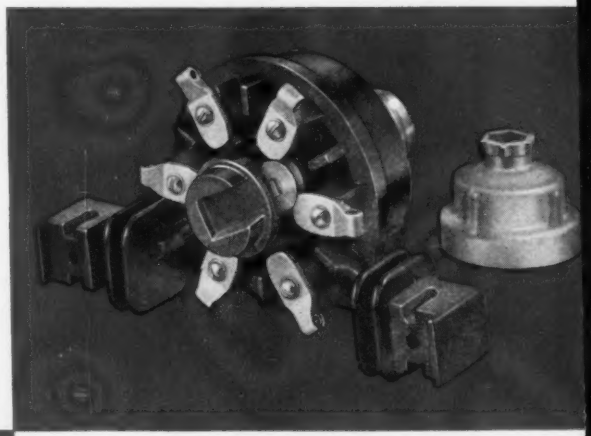
IN CANADA: Dominion Cutout Co., Ltd., Toronto

.....if you use

Eliminate costly, time-wasting, dangerous steps

with the externally- RT & E TAP

The industry—famous RT & E Tap Changer has been redesigned, and repositioned on the tank, for even greater ease in tap setting, speed and convenience in changing tap positions.



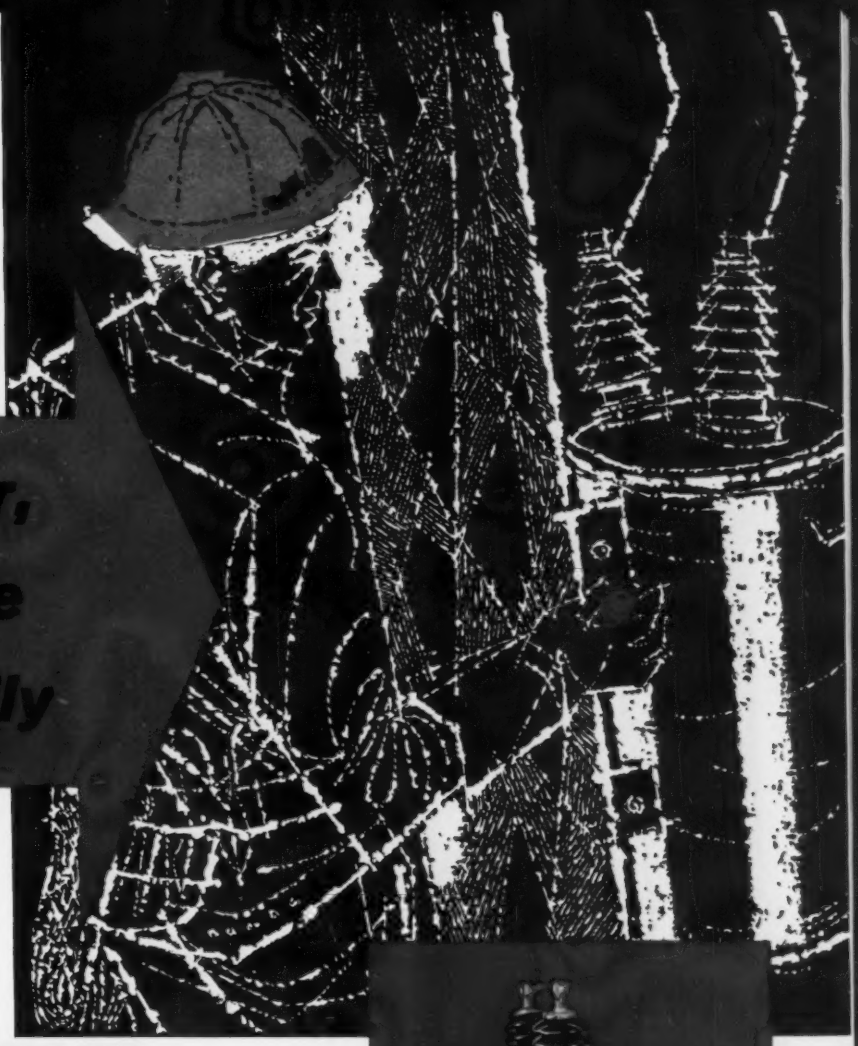
FAST 1-2 ACTION

STEP 1
Remove screw-on type cap. Note husky, hand-size gripping area.

STEP 2
Reverse cap and use as handle. That's all there is to it!

The new RT & E tap changer body is molded in one piece, multi-skirted for long creepage and high surge strength. Material used is electrical grade, wood-flour filled phenolic of high thermal stability. Contact is made through a bridging roller, under spring pressure, especially grooved around the periphery to provide double contact surfaces. This assures low resistance and cool operation.

taps



Do it faster, safer, more economically

dependable operated CHANGER

- No handhole cover to remove!
- Reduces danger of tank breathing!
- No lengthy expensive, tap changing time!
- No confusion on tap setting!
- No danger of oil contamination!

Ask your RT&E representative to demonstrate the RT&E Tap Changer or write for complete details to . . .

Engineering Talent
Concentrated on One Idea—
A Better Transformer!

RT&E CORPORATION

WAUKESHA, WISCONSIN • PORTLAND, OREGON

EVERY COPPERWELD GROUND ROD is

molten-welded

This microphotograph of the Molten-Weld shows how the grains of copper and steel interlock to form a permanent, continuous weld. No other process achieves this inseparable union.

WHAT'S THE ADVANTAGE?

By this unique Molten-Welding process—used only by Copperweld Steel Company—a uniformly thick sheath of pure copper is inseparably welded to an alloy steel core. Under carefully controlled conditions, the grains of both metals interlock to form a permanent, continuous weld. And from the moment of this union, Copperweld* performs as one metal. Hot rolling, cold drawing, temperature changes, pounding, or abuse cannot destroy the Molten-Weld in Copperweld Ground Rods.

WHAT DOES THE MOLTEN-WELD IN COPPERWELD MEAN TO YOU?

In service, this permanent Molten-Weld completely eliminates the possibility of harmful electro-galvanic action in the presence of moisture. There are no microscopic cracks, fissures, or pin holes in the thick copper exterior to admit moisture and give destructive rust a foothold.

So, for permanent grounding protection at lowest annual cost, insist upon Copperweld Ground Rods and get the rust resistance and conductance of copper plus the strength and easy-driving qualities of alloy steel. The time-tested dependability and economy of Copperweld products have been proved in service for over 40 years. **Trade Mark*

COPPERWELD STEEL COMPANY WIRE AND CABLE DIVISION *Glassport, Pa.*

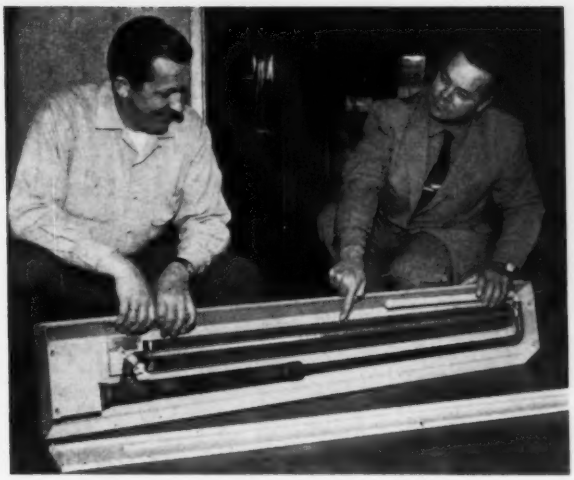
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

DRIVE DEEP with Copperweld sectional ground rods

FOR low resistance THE YEAR 'ROUND

PRODUCT NEWS

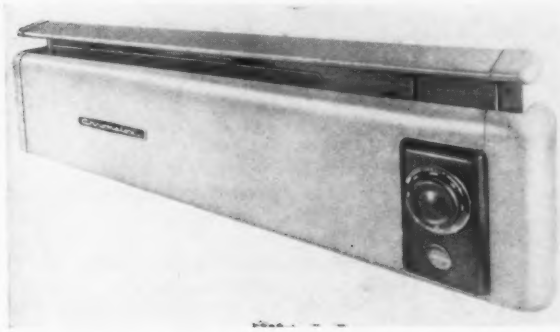
New Designs and Applications



Baseboard Hot Water

(1) *International Oil Burner Co.*, 3804 *Park Ave., St. Louis, Mo.*

A new hot water electric baseboard heating unit, developed in Seattle by Loyal Reynolds and Harry Welch of Aqua Flo Inc., is now in production by the above manufacturer. The unit's heating tube is a sealed unit containing an electrical heating element and an antifreeze solution. When water is heated to more than 300 F thermal pressure causes the solution to circulate through a finned tube, which dissipates the heat for 30 minutes after the element is turned off thermostatically.



Preassembled Heater

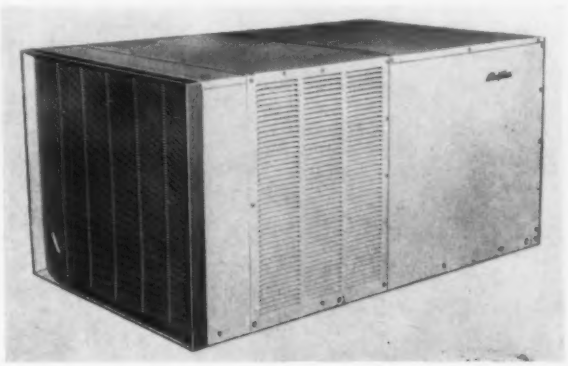
(2) *Edwin L. Wiegand*, 7500 *Thomas Blvd., Pittsburgh* 8, *Pa.*

Fast and simple installation is a feature of a completely assembled and painted electric baseboard heater offered by this company. The unit is constructed of heavy-gage steel and has a built-in thermostat. A variety of lengths and heating outputs is available. Attachment to a wall is by four screws.

Baseboard Heater

(3) *Electric Heating Division, Cavalier Corp., Chattanooga* 2, *Tenn.*

A new fully enclosed heating element in this company's baseboard heaters is said to provide better uniformity of heating and cleanliness. The element is a highly compressed tubular steel sheath containing the resistance element. Welded continuously to the tubular steel sheath is a vertical fin that radiates heat without creating dust traps, the company reports. Surface temperature does not exceed 125 F. Output is said to be 200 w per lineal foot.



Heat Pumps

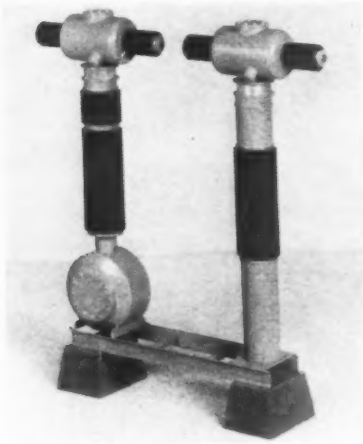
(4) *Perfection Industries*, 1135 *Ivanhoe Rd., Cleveland* 10, *Ohio.*

Three new self-contained air-cooled heat pumps said to have balanced capacities on both heating and cooling cycles have been developed by this company. They are being manufactured in 2-, 3½- and 5-hp sizes. Features are step starting, two-stage cooling and heating, diagonally mounted evaporator cooling coil, rapid de-icing and special controls for proper distribution of refrigerant. They are said to meet FHA requirements.

Dehumidifier

(5) *Suttle Equipment Corp., 135 S. LaSalle St., Chicago 3, Ill.*

A portable (on wheels) room dehumidifier is now available from this company. It is said to be able to remove two to three gallons of water from the atmosphere every 24 hours and is designed for industrial or home use. A removable rust-proof drawer can be emptied or a permanent drain can be installed.



Air Circuit Breaker

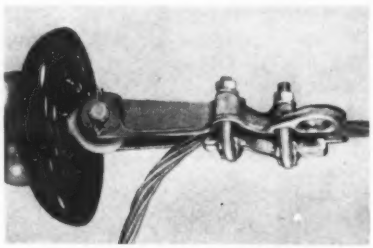
(6) *General Electric Co., Schenectady 5, N. Y.*

This company's high voltage switchgear department announces a new breaker design for outdoor air blast power circuit breakers for high voltage use. The design is based on a pressurized interrupter principle utilizing modular units to provide all required ratings. Each added column increases the voltage and interrupting rating. Stated advantages are: high speed interruption, abilty to withstand maximum voltage recovery rate associated with transmission line faults, and 75% less out-of-service time for routine inspection in comparison with oil-type power breakers.

Heat Pump

(7) *O. A. Sutton Co., 1814 W. 2nd St., Wichita, Kan.*

A new unit offered by this company is an all-electric heat pump available in sizes from two to five tons for use in existing homes, new homes and industrial buildings. Trade name of the new product is Vornado. Full information is available from the manufacturer (above), or from Sues, Young & Brown Inc., 3636 S. Bronson St., Los Angeles 8, Calif.



Strain Clamp

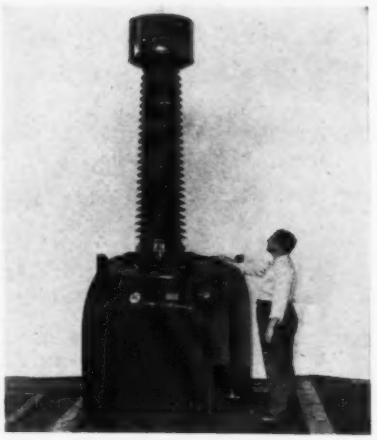
(8) *Anderson Electric Corp., Birmingham, Ala.*

A new bronze dead-end strain clamp with greater holding power and easier installation is offered by this company. It is a cast, high tensile, bronze alloy, straight line clamp equivalent to the company's type ADE aluminum clamp, with a wide range of sizes for adaptation to a variety of jobs. Also available with an eye on the keeper piece so cable can be easily inserted in hot line work.

Service-Entrance Sleeves

(9) *A. B. Chance Co., Centralia, Mo.*

This company now offers 16 new sizes of service-entrance compression sleeves that accommodate No. 10 stranded (8 solid) and No. 8 stranded (6 solid) conductors. Conductor sizes are printed in large letters and figures on end tapes. The tapes are also color-coded to aid identification. Each sleeve is filled with electrical contact aid. A metal wall in the center of the sleeve serves as a conductor stop. Standard compression tools can be used.



(10) This 230-kv Allis-Chalmers potential transformer, destined for the transmission lines of Southern California Edison Co., is said to be a new high in potential transformers. New insulation techniques are utilized, including coordinated insulation and additional refinements in the use of materials. The unit is said to have corona-free construction, and is hermetically sealed. It weighs about 60% less than conventionally constructed potential transformers in this rating.

Thermostat

(11) *Tennessee Plastics Inc., Johnson City, Tenn.*

Produced in four models from 15 to 30 amp, this new thermostat features a brushed chrome case and removable face panel that can be painted to match a home color scheme. Range is 34 F to 86 F, and temperature differential is said to be ½ F.

Chain Hoist

(12) *A. B. Chance Co., Centralia, Mo.*

This company is producing a two-ton chain hoist for work such as sagging long conductor spans and pulling up slack guy wires. The hoist weighs 24 lb and controls can be operated without removing work gloves. Features are an aluminum housing and handle, and a shaft of hardened steel. Manipulation of a lever allows "free wheeling," and the lever locks automatically when the hoist pulls a strain. It has 5½ ft of lift plus half and full link take-up. Moving parts are fitted with permanently lubricated bearings.

Fill in Coupon . . . p 31

if *your cable must endure...*

—turn to Kerite with assurance. For Kerite's wide range of quality insulated cables are unrivaled for ***on-the-job*** dependability and economy under all types of operating conditions.

In actual use, Kerite cables have been examined, salvaged, and returned to stock after as many as 50 years of continual service.

So we think that we may properly say: when quality and long life are essential . . . you can rely on Kerite.

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you get from

URL AND URF

REGULATORS . . .

WITH 1¼%-STEP

REGULATION

Westinghouse URL and URF voltage regulators, with 1¼ % steps, provide improved regulation . . . with a minimum of corrective operations. Here's why:

The "set" bandwidth describes the limits outside of which voltage correction is called for. Since correction stops when voltage is brought back within the band, smaller steps require narrower band settings for the same quality of regulation . . . but narrower band settings require extra tap-changer operations.

Thus, the 1¼ %-step regulation of Westinghouse URL and URF regulators provides an effective voltage that is closer to the balance voltage—the narrowest *effective* bandwidth, with the *fewest* operations.

Call your Westinghouse representative for the complete story about this special quality of regulation—the result of PLOWBACK OF EARNINGS into research to provide better methods for voltage control in your electrical distribution system.

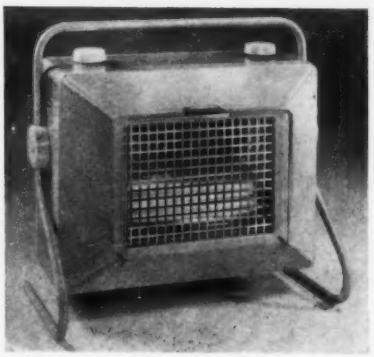
J-70861

YOU CAN BE SURE...IF IT'S Westinghouse

Perimeter Floor Convector

(13) *Wesix Electric Heater Co., 390 First St., San Francisco, Calif.*

This company announces a newly designed floor convector said to provide perimeter heating wherever wall space is not available, such as along window walls and beneath sliding glass doors. The heating elements are low temperature, high velocity type to maintain moderate grille temperature, below 150 F. Overtemperature control turns the heater off should air flow be cut off. To clean, the grille and attached inner assembly is lifted out, automatically disconnecting power and exposing an unobstructed outer can. Finish is hammertone bronze, and depth is 11 in. Available in two sizes: 36½x47⅞ in. and 52½x63⅜ in., and in 1,250, 2,000 and 3,000 w. One or more units may be installed in a room and controlled by a single wall mount thermostat, type DLV, up to 6,000 w.



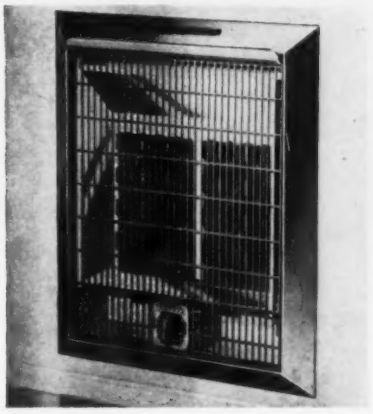
Electric Portable

(14) *Titan Sales Corp., 701 Seneca St., Buffalo 10, N. Y.*

New colors and styling changes, instant heat, infrared glowing elements and directional heating are features of the new portable electric heater line offered by this company. The heater swivels on a tubular steel stand to enable the user to beam heat from floor to ceiling levels. A choice of 1,650- or 1,320-w elements in the same unit is available. Maximum output is 5,600 Btu. Automatic thermostat control is included.

For more information fill in coupon . . . p 31

Pictured here is the electronic "brain" that Minneapolis-Honeywell Regulator Co. designed for the Queen Elizabeth Hotel in Montreal. The control center gives continual checking and logging of key temperatures and other data, adjustment of controls, starting and stopping of heating and cooling equipment and aids in the investigation and handling of complaints. The automatic typewriter (at left, on desk) logs temperatures hourly. One person operates the system



Wall Heaters

(15) *Swan Mfg. Co., Vancouver, Wash.*

Built-in heavy-duty double-pole thermostats and lifetime stainless steel reflectors are two features of a new line of flush-type electric wall heaters being introduced by this company. Nickel chrome heating elements are mounted at the front of large size ceramics. The grille lifts up and out for cleaning. Units are fully assembled. Available in four sizes from 1,000 to 4,000 w.

Residence Heat Pumps

(16) *General Electric Co., Air Conditioning Dept., Bloomfield, N. J.*

This company recently announced the availability of a new Weathertron line of heat pumps with a new space saving design of the interior air handling section. The new split system heat pump is said to be flexible, and offers economies to the builder and the home owner. Air circuits for indoor and outdoor sections have been simplified, and special installation systems and procedures have been eliminated. The air handling unit (pictured) is the only part of the equipment to be placed within the house.

Westinghouse

1¼%-step

regulation . . .

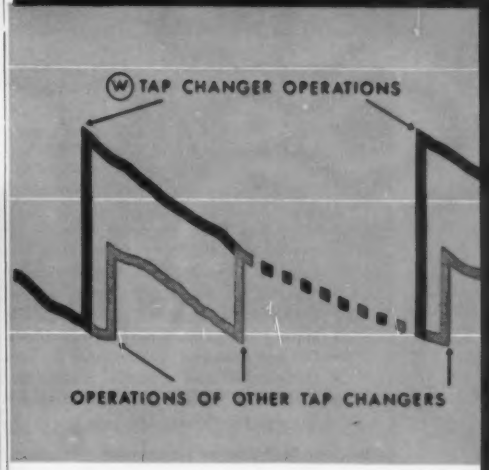
REQUIRES

FEWER

OPERATIONS,

INCREASES

CONTACT LIFE



Westinghouse URL and URF regulators with 1¼% steps require 42% fewer operations to maintain the narrowest *effective* bandwidth. This means that:

- Contact life is increased.
- Oil carbonization is reduced.
- Maintenance costs drop.

For better regulation, insist on the total package: 1¼% step, inverse-time relay, instant-response tap changer.

J-70862

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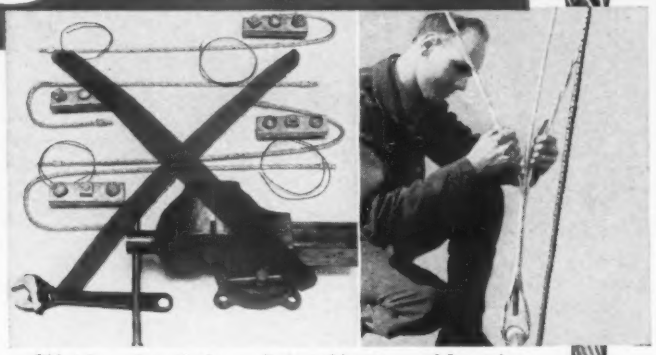
UP TO 49% $AVINGS
on materials alone
with
Fine Fanner Superformed
FANNGRIPS
FOR DEAD-ENDING GUY STRANDS



Old style costly methods are eliminated by the use of Fanngrips.

Now . . . costs compiled from typical guying methods using Fanner Fanngrips in comparison to other types of gripping devices show savings up to 49% *in materials alone* . . . in addition to the tremendous savings in time and labor!

Now . . . when savings are so important . . . here is more reason than ever to take advantage of the many Fanngrip features offered by no other type of gripping device:

- Provide maximum strand strengths.
- Eliminate laborious field fabrication.
- Self-clamping, permanently tight.
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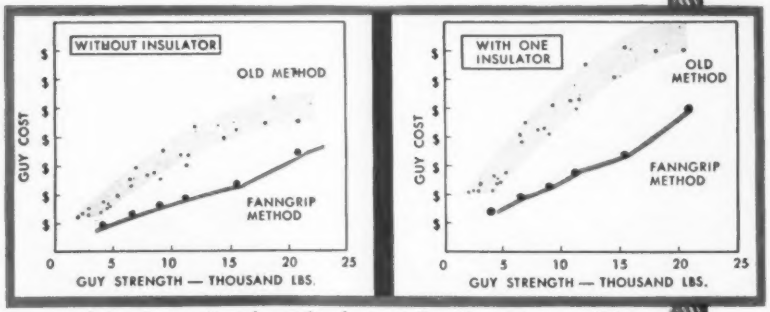
- Do not damage guy strand surfaces.
- Dangerous and wasteful strand ends eliminated.
- Available in "B" or "C" coated galvanized steel, or copperweld.

Ask for cost-saving data today!



Two of a series of graphs demonstrating the savings available through Fanngrips over ordinary gripping methods.

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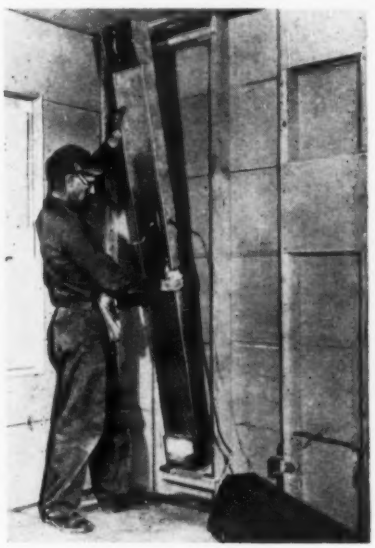
Portable Conditioner

(17) *Carrier Corp., Syracuse 1, N. Y.*

This company is manufacturing a 60-lb portable air conditioning unit that serves for cooling-heating and as a dehumidifier. At left, is Russell Gray, Carrier Corp. vice-president, and holding the new unit is William Egan, sales manager, packaged equipment.



Electric Forced Air

(18) *Electrend Products Corp., State & Water Sts., St. Joseph, Mich.*

The counterflow principle is used in this redesigned unit. Warm air at the ceiling is drawn into a wall-enclosed duct, reheated, and issued at floor level. A motor and impeller force the circulation.

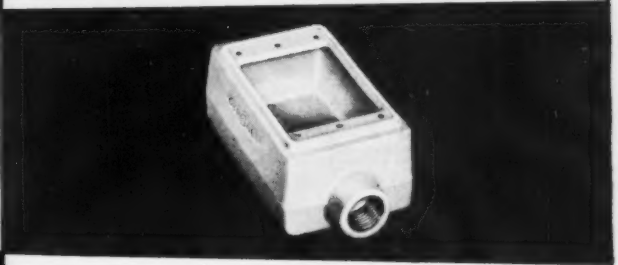
Cut costs... without cutting corners! Specify... GEDNEY CONDUIT BODIES

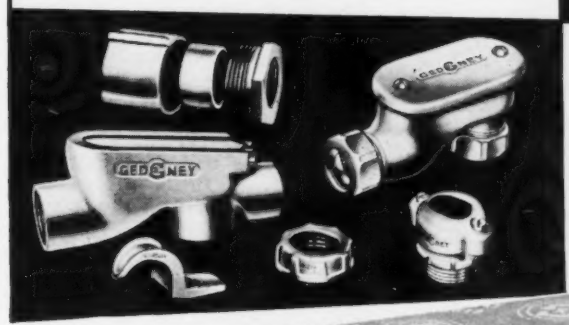
Gedney Conduit Bodies mean lowest installed cost! That's because they are skillfully made of tough, *malleable* iron, then hot-dip galvanized, and finally, they must pass the toughest inspection. Accurate machining and threading assure easiest installation . . . ruggedness assures longest service life!

THE GEDNEY CONDUIT BODY LINE INCLUDES ALL TYPES—SIZES ½" TO 4"

TYPE LB—Threaded—for heavy-wall rigid conduit. Use them with Gedney entrance fittings, straps, clamp backs to get an *entire* conduit system that is hot-dip galvanized.

TYPE FS—Threaded—shallow bodies for heavy-wall rigid conduit. Hot-dip galvanized finish prevents corrosive deposits—means easier installation, longer life.





SCORES OF OTHER GEDNEY FITTINGS are available for every purpose—all carefully designed, manufactured and inspected to assure economical installation and maximum customer satisfaction.

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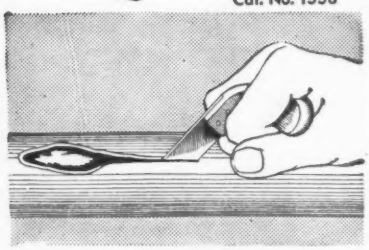
NEW KLEIN
stripping tool
for all types of control cable

Patents 2398979
2691822

Cat. No. 1558



Here is a new tool developed by Klein, designed to strip insulation from all types of control cable, flexible cords, PWC, telephone cable with vinyl or polyethylene jackets and bus drop.

Handle of cast aluminum, light in weight and with convenient grip; knife of tempered tool steel may be sharpened and is easily removed for replacement. This tool strips insulation from a few inches to as many feet as desired swiftly and simply. Does not damage conductors inside weatherproof sheath.

Write for bulletin giving complete information.

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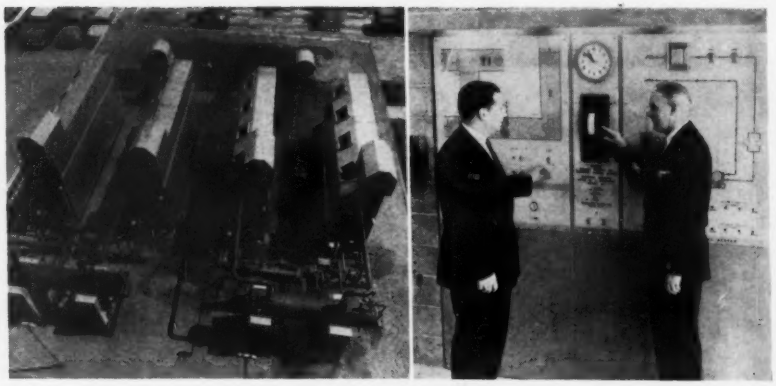
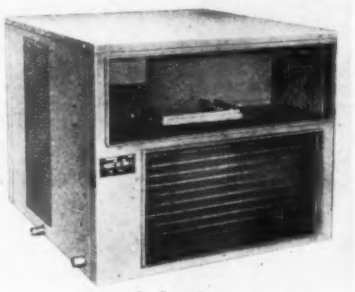


The big heat pump installation pictured has the double distinction of being the first installation of its kind in New York state and of being the northernmost building ever to be heated by an air source heat pump, requiring no supplementary heating system of any kind. Designed and built by York Corp., the huge installation is in the Amherst Engineering Laboratory of Sylvania Electric Products Co. in Buffalo, N. Y. The four big condensers are shown at the left and Maxwell C. Scott and George Briley of Amherst Laboratory and York Corp., respectively, are beside the system's supervisory data center and control panel



Packaged Air Conditioners

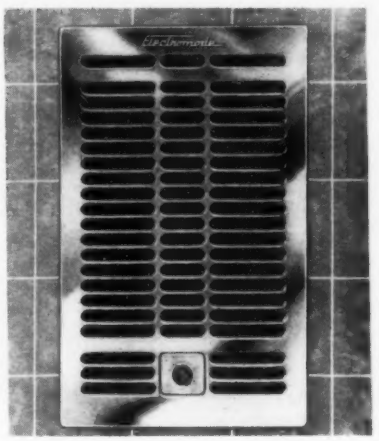
(19) *Ilg Electric Ventilating Co., 2850 N. Pulaski Rd., Chicago 41, Ill.*

A new line of self-contained air-cooled air conditioner units for commercial buildings and residences is announced by this company. The line is comprised of two 2-hp units, two 3-hp units and a 4-hp unit. The line covers a capacity range from 19,700 Btu/hr to 40,000 Btu/hr. They can be used with existing warm-air ducts or as a separate system. No water or plumbing connections are required. Designed for either indoor or outdoor installation.

Commercial Conditioning Units

(20) *American-Standard, American Blower Division, Detroit 32, Mich.*

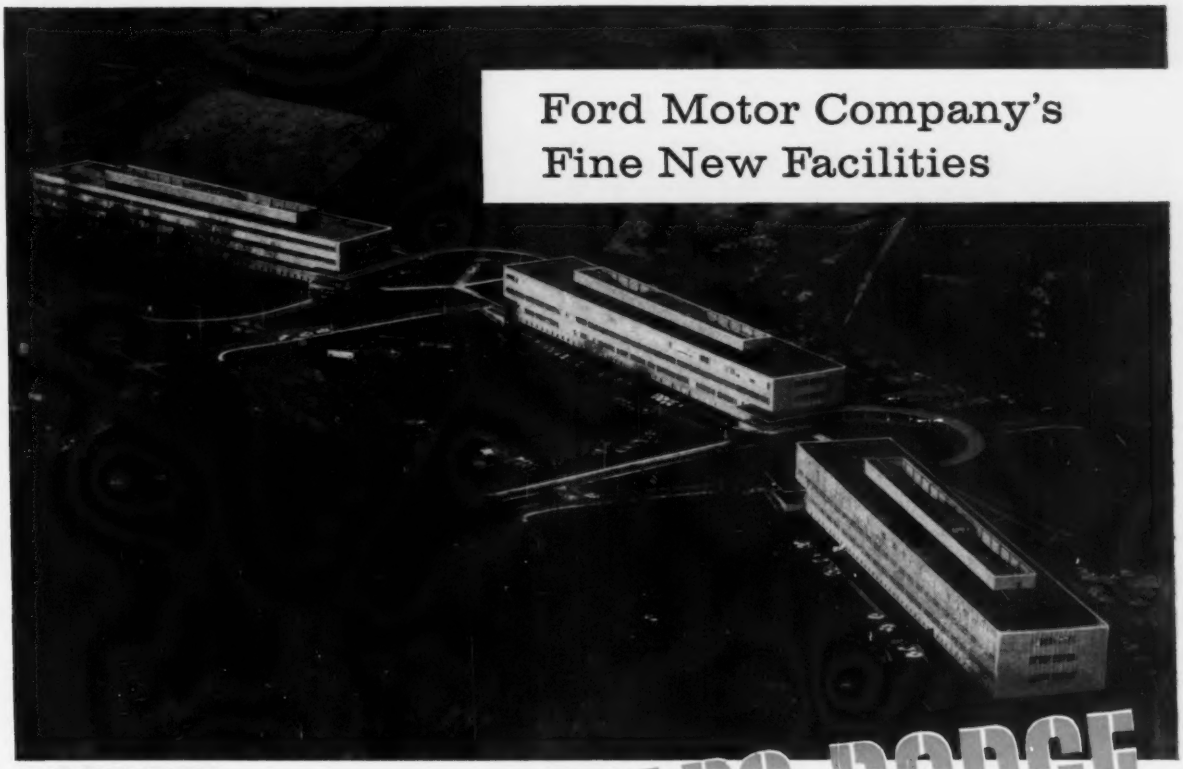
A new line of air-cooled commercial air conditioning units rated at up to 254,000 Btu/hr gross cooling capacity is now available from this company. A concept of matched performance ratings using oversize condensers to provide the greatest size range selection is used. The performance ratings concept gives 12 capacities, using only six basic units. Space is available for larger fan motor if needed.



Radiant Heater

(21) *Electromode Division, Commercial Controls Corp., Rochester 3, N. Y.*

A wall-type radiant heater, designed for bathroom or small rooms, is announced by this company. Available in both automatic and manual models, the unit features a highly solid aluminum reflector and flushed mounting. The element is shielded by a stainless-steel grille.



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WIRE BY PHELPS DODGE

These new buildings for the Staff and Product Engineering activities of the Ford Motor Company at Dearborn, Mich., are striking examples of structures designed to provide for the specific needs and comforts of the people who work there.

Only the finest equipment has been installed in these buildings, including electrical wiring of the highest quality, consisting of dependable Phelps Dodge building wire and Phelps Dodge paper-insulated lead-sheathed power cable.

On every wiring job where top-quality performance, expert workmanship and experienced "know-how" are called for, *it pays to rely on Phelps Dodge and your Phelps Dodge distributor!*

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No. 1 of a series...

the dead-ends* you never see improve the ones you buy

RESEARCH & ENGINEERING TEST SAMPLE
TYPE OF TEST: Corrosion
EQUIPMENT USED: Salt Fog Chamber
SPECIMEN NO.: 10
TEST STARTED: 3/24/58 9 a.m.
TEST TERMINATED: 5/23/58 2 p.m.

Most metallurgists and product design engineers are aware that laboratory corrosion tests have relatively little quantitative significance in terms of predictable service life. The only valid conclusion which may be drawn from such tests is that the particular samples tested had a certain relative resistance to the specific corrosive environment in which they were placed.

Nevertheless, corrosion proof-testing is considered an essential phase of product quality control at the Preformed Research and Engineering Center. In addition to conventional raw material quality control procedures, observations of relative corrosion rates are also made on finished products. As an example of objective performance standards used, Preformed Guy-Grip dead-ends are required to have corrosion resistance exceeding that of the strand for which they are designed. To assure compliance with these minimum quality standards, samples taken routinely from production are applied to strand specimens and exposed to a severe corrosive environment under closely controlled laboratory conditions. Periodic inspections are also made of field test specimens installed at locations throughout the country which are considered to be representative of extreme marine and industrial contamination. This constant laboratory and field surveillance has undoubtedly been largely responsible for the fact that there has never been a report of a Preformed Guy-Grip dead-end having failed in field service due to corrosion.

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PREFORMED LINE PRODUCTS COMPANY • 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable: Preformed-Cleveland ... manufacturer of armor rods, dead-ends, Guy-Grip dead-ends and other line accessories.

* Made in accordance with or for use under Patent No. 2,761,273; other patents issued and pending.

BULLETINS ETC.

(22) DATA SHEET—"Ventilation and Air Conditioning For The Farm" is the title of a new Farm Electrification bulletin, Leaflet No. 41, available from the University of Idaho, College of Agriculture, Moscow, Idaho. Types of fans and requirements of a ventilating system are discussed.

(23) ROOM THERMOSTAT — United Electric Controls Co., 85 School St., Watertown 72, Mass., has available a new brochure giving details on its new Type B59 thermostat. The control functions equally well on either line or low voltage, according to the company. Applicable to both heating or air conditioning. The brochure is entitled "Room Thermostats."

(24) WALL CONTROL—A new wall control for electric heating and cooling that is only ¾ in. deep is described in literature available from Mears Electric Controls, Swan Island, Portland 17, Ore. Called the "Decorator," the thermostat can be painted to match or blend with any interior. It is a line-voltage model with a range from 35 F to 90 F. The manufacturer says temperature differential is less than ½ F.

(25) CONTROL PACKAGE—A new control package for electric heat classroom unit ventilators is described in a data sheet, F-8705, available from Barber-Colman Co., 1300 Rock St., Rockford, Ill. The control package may be applied to any conventional classroom type electric heat unit ventilator, according to the manufacturer. A positive-acting step control is said to eliminate the necessity of expensive variable voltage regulators and magnetic contactors in the control of electrical input to the heating elements.

(26) SCHOOL HEAT—A new eight-page brochure, "The A-B-Z of Electric Heat Today," is designed to encourage school planners to make a firm decision on the type of heat before the building is planned. The brochure is available from Electromode, 570 Culver Rd., Rochester 9, N. Y.

(27) RADIANT HEATING — Fostoria Pressed Steel Corp., Fostoria, Ohio, now has available information about the wave lengths that are produced by the various radiant sources. Other basic data pertaining to radiant principles are available also. Request No. 58-120.

(28) AIR AND LIQUID HEATING—Two bulletins offered by Edison Heatube Division of McGraw-Edison Co., 612 Grand St., Allegan, Mich., describe the company's two latest products. One of the products is adapted for air heating in ducts and the other for thermostatically controlled liquid heating. Ask for Bulletin TAD-58 and Bulletin IH-58.

(29) FILTERING PRODUCTS — Owens-Corning Fiberglas Corp., Toledo 1, Ohio, has available a four-page publication describing and illustrating air filtering products for commercial and industrial applications. Eight photographs illustrate standard filters for air conditioning and heating units.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
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Not good after October 1

Please send me, without obligation, the new product information or catalogs:

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Type GTC 2
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Copper Bonded Pigtail

Type GUV
U-bolt ground clamp parallel or 90°

Steel Driving Stud for Sectional Ground Rods

Copper Alloy Coupling for Sectional Ground Rods

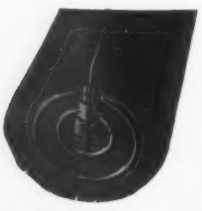
Copper Bonded Sectional Ground Rods

Copper Bonded Regular Ground Rods

Type GG
Ground Rod Clamp
Socket set screw

Type GGH
Ground Rod Clamp
Square head bolt

Type B
Budget Line Ground Rod Clamp
Square head bolt



Type GP 100
Electrolytic Copper Pole Bottom Plates
7½", 10", 14" dia.

Blackburn grounding devices will save you thousands of dollars annually in preventing burnouts of expensive overhead equipment. This complete line simplifies your stocking problem—one source for all your needs. Like all BLACKBURN products they are constructed of high-strength corrosion resistant materials—designed for easy installation and engineered for long-lasting, trouble-free grounding. Always specify BLACKBURN.

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TRANSMISSION

Equipment News

DISTRIBUTION

Now Is the Time to Identify Values

by **D. K. BLAKE**

D. K. BLAKE, widely known engineer, economist and editor, is the Economic Consultant to User Industry Sales, General Electric Company.

Now is a good time to revive some of those studies and projects that were laid aside because management needed its available money for generation and major transmission expenditures. Distribution had to wait, for it could always be made to work after a fashion.

Once given the appropriations for these projects, it is of the utmost importance for you to guide your purchasing management so they can fulfill their obligation to get the most value for your company's money. Now, value has two definite, and distinct aspects. The first is *Value-in-use.* Your company buys "usefulness" or "utility." No more and no less. This *Value-in-use* is supreme. The second aspect of value is *Value-in-exchange*—the dollars you will pay in exchange for such usefulness.

A product having added value in the sense of added utility or added usefulness gives the greatest *Value-in-exchange* when your suppliers' prices are the same. Comparison, therefore, is essential in order to determine the added or marginal usefulness of products which are approved for use on your system. You, the user, must make this comparison for your purchasing manager. He is not in a good position to know the usefulness of features claimed by suppliers. Your buyer is in danger of thinking that the products of all suppliers on the so-called approved list have equal usefulness. He may, therefore, exercise his choice on some grounds other than *Value-in-use,* and consequently not get his best product *Value-in-exchange* for a dollar. To that extent he fails in his desire to make his purchases count the most in contributing to the profitability of your company. Therefore, he must rely on you, the actual user, to give him this comparative information so he can make a sound purchasing decision.

Our sales engineers, product specialists and application engineers will welcome your request to compare our products' worth in added *Value-in-use* to your company.

OPERATION up turn

GENERAL ELECTRIC

Now is the time to buy for extra values . . .

an EXTRA VALUE product feature

OPERATION upturn
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1-ϕ 250-kva on the pole

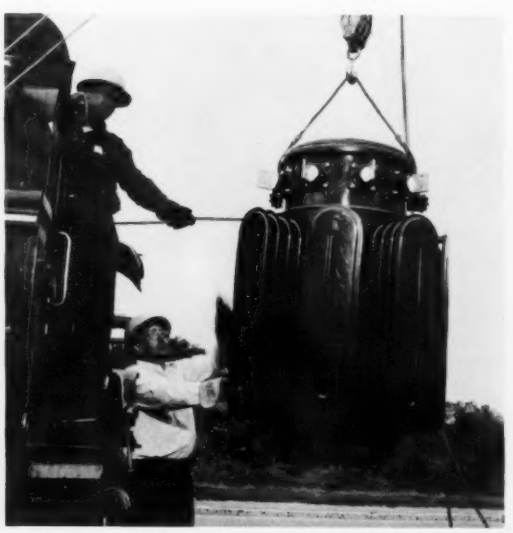
1750-pound unit gives extra value where space is at a premium

This completely new pole-type transformer is solving many location problems in crowded urban areas. Small size, light weight and improved electrical characteristics result from basic design improvements. New radiators and a new core-and-coil design, for example, help keep weight down, performance high.

No unusual equipment is needed to install the new 250-kva units.

They are equipped with Type C support lugs, oil-drain plug and sampling device, liquid-level marking, and internally operated tap changer.

For operating characteristics and delivery schedules, call your nearby G-E Sales Office.



250-kva pole-mounted units result from a new core-and-coil design and new panel radiators which help keep weight down.

3-ϕ 225-kva on the pole

Cut installation costs, solve location problems with 2500-pound pole-type units

Substation transformer ratings, on the pole, mean money saved in initial investment and installation costs to users of these new lightweight G-E transformers.

The large reduction in pounds per kva of capacity is due to a unique design of core and coils and the use of improved magnetic steel. With substation capacity now available in pole-mounted units, many location problems in crowded areas are solved with major savings in construction and installation costs.

The new lightweight transformers shown in the photos are rated 225 kva, 4160 volt, 3 phase. For complete information, contact your nearby General Electric Sales Office, or write to General Electric Co., Section 431-76, Schenectady 5, N.Y.

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Crowded locations are readily served with G.E.'s new 225-kva pole-mounted transformers. 3-phase units weigh 2500 pounds.

*Implications of the New "Evans" Core**

HAROLD BRUNTON, JR.

Manager—Network Transformer Sales

It has been said that many important developments are remarkably simple in their concept. Certainly this is true with the new "Evans" core, which is a major design advance and yet fundamentally straightforward.

Designers have considered using a wound core for network transformers ever since 1937 when G.E. introduced a spirally wound distribution transformer core using cold-rolled strip steel. However, large transformer ratings and three-phase units presented complex design and manufacturing problems. Tom Evans solved these problems by using two wound cores and then winding a third core around the other two.

Straightforward as this approach seems, to put it into practice required years of development, including new materials, new design techniques and the use of new manufacturing methods. One by one these individual problem areas were conquered.

The designers were continually faced with the fact that network transformers must meet more stringent requirements than most other transformers.

Short-circuit strength must be higher because of network system characteristics. Losses must be lower to minimize heating because the units are usually installed in small confining spaces. Corrosion resistance must be greater because the units are often completely flooded by contaminating liquids.

We believe that a remarkable reduction in size is made in the new "Vaultmaster" network transformer. Even more remarkable is that it was accomplished without sacrificing any of the other characteristics which have long been offered by G-E network transformers. In fact, further improvements have been made in many of these characteristics. We believe, therefore, that the "Evans" core definitely means ***extra values*** for our customers.

*Named after its originator, T. M. Evans, a G-E transformer design engineer.

New Core, New Radiators, New Thermal Design in "Vaultmaster" Networks

Smaller, lighter transformers simplify installation and maintenance

The new G-E "Vaultmaster" design represents important advantages for network users. Smaller transformer size can mean less expensive vaults, easier installation, and often increased kva capacity for existing vaults. For example, a new 750-kva unit is about the same size as the former 500 kva. Three innovations make the smaller size possible.

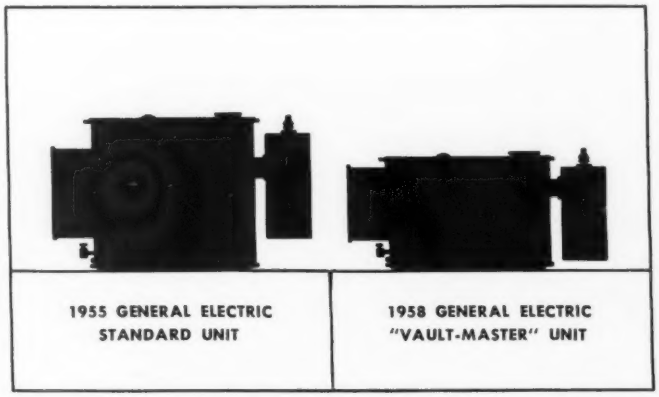
The "Evans" core is a new design which makes it possible to use the famous G-E Spirakore† core construction on large three-phase units. This core utilizes the grain-oriented cold-rolled strip steel to its best advantage, resulting in smaller core and coil size and improved characteristics.

Panel radiators provide a tremendous amount of heat dissipation in a small space. In addition, this radiator design cuts down the number of tank openings and gives a smooth, uncluttered surface that is easy to keep clean.

Balanced thermal design is the new G-E approach to winding design which balances the thermal increments to provide the maximum of overload capacity. Facilitated by the extensive use of computers, the new winding design also increases reliability.

†Registered trade-mark of General Electric Co.

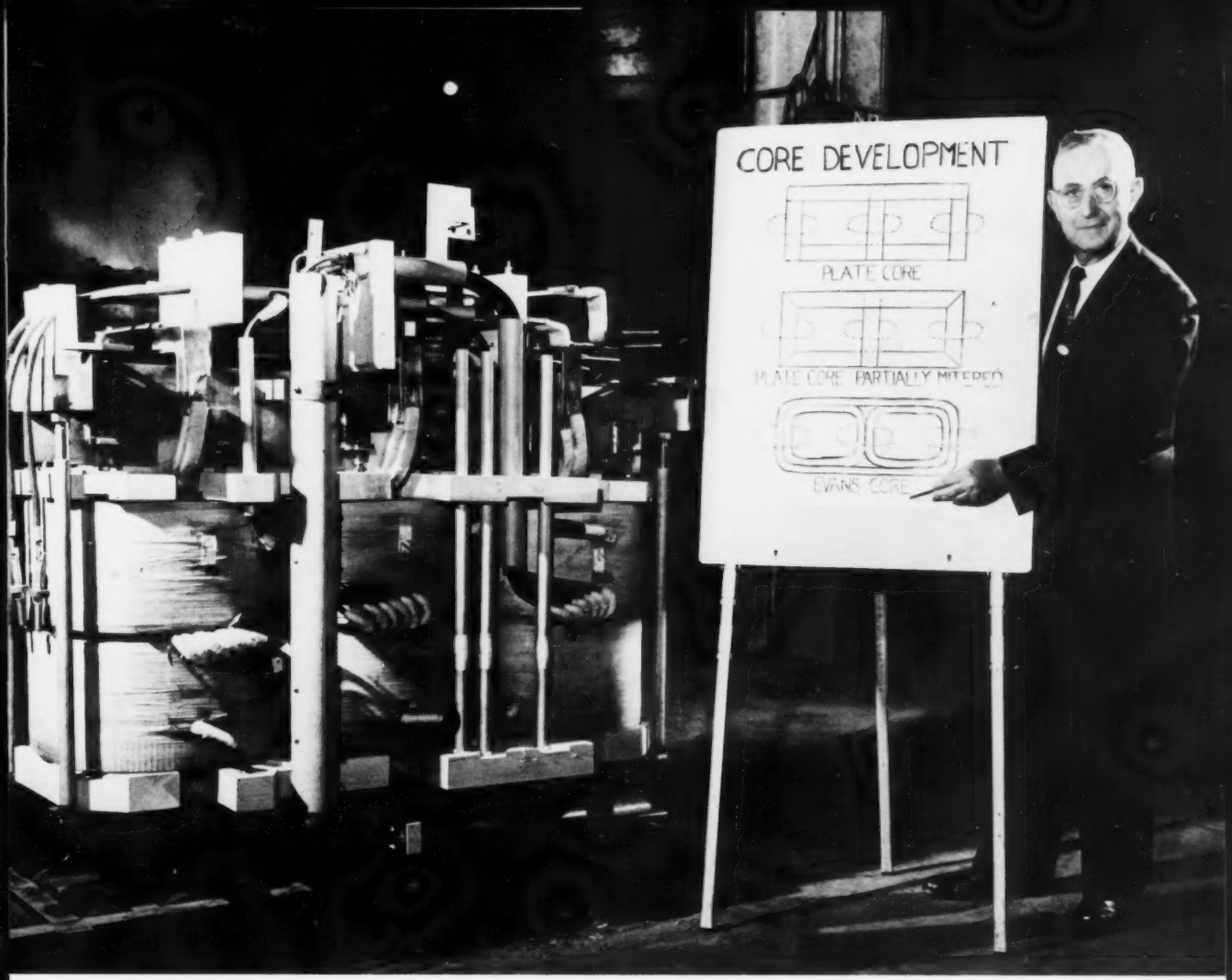
DRAMATIC SIZE REDUCTION IS EXTRA VALUE



VAULTMASTER SAVES ON FUTURE CHANGES with its new low height. There is ample space for addition of higher-rated units or oil-fuse cutouts or capacitors. Smaller size gives "elbow room" for easier maintenance.

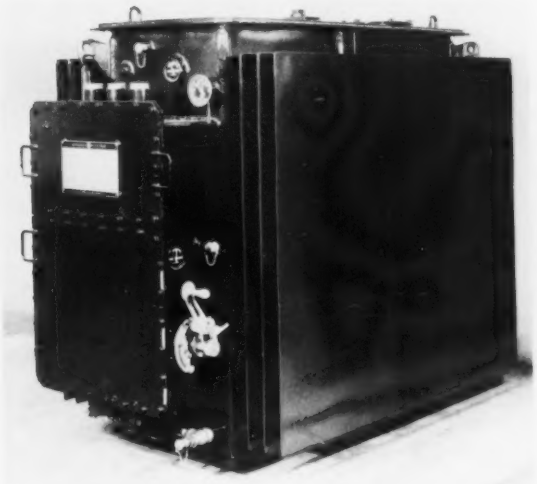
an EXTRA VALUE product feature

OPERATION upturn



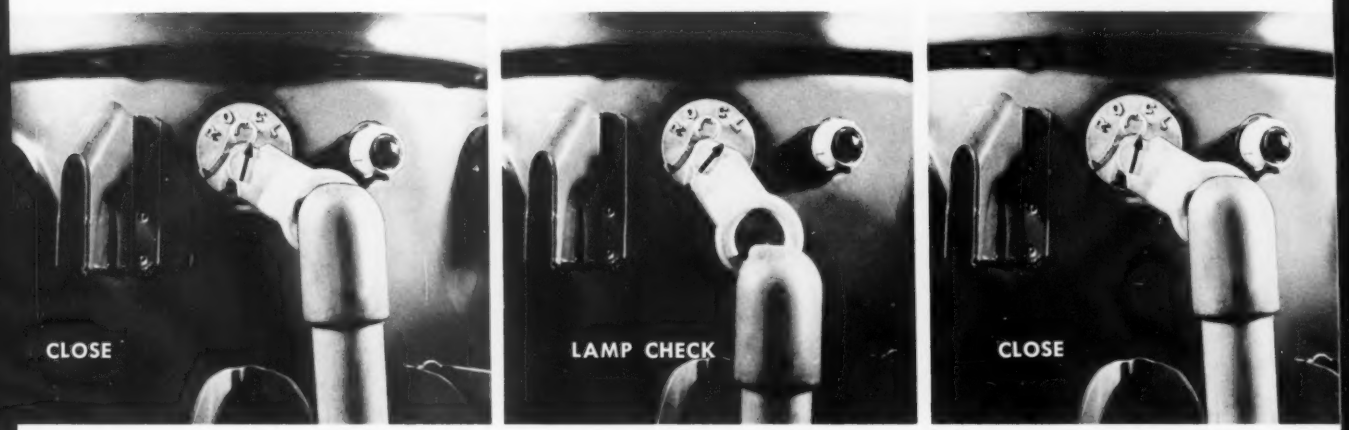
NEW CORE DESIGN for G-E network transformers is shown by its originator, T. M. Evans. Chart shows evolution of core design from 1955 when all standard network units featured plate-core construction. At the left is a new 750-kva core and coil unit, featuring the Evans design which means smaller, lighter transformers.

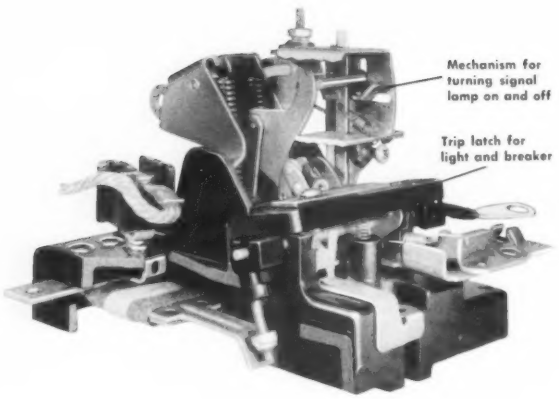
BALANCED THERMAL DESIGN tests prove even, controlled heating, reduced hottest-spot temperatures, resulting in extra-long transformer life and increased loading.



G.E.'S PANEL RADIATORS increase reliability since there is less chance for leaks with only eight entrances to tank. Smooth panels are easy to keep clean on these units.

Two New Money-Saving Extra Values with General Electric Distribution Transformers





Every G-E breaker lamp now checked easily without removal from transformer

This convenient lamp-test provision is now available on all General Electric self-protected transformers. The sequence photos above show how the lineman can check the lamp quickly, without removing it from the tank. This provision has been added to the AHT-1 breaker (at left), which is used on units below 37½ kva rating. The G-E T-2 breaker—for units 37½ kva and above—has the same lamp-test feature.

Bushing keyed to tank cover won't turn as lineman tightens connection

Linemen like this added value feature of G-E distribution transformers. Terminal bolts can now be tightened with a one-hand operation since in addition to keying the terminal bolt to the bushing, G.E. now keys the bushing to the tank cover as well. Thus, the bushing will not rotate in the cover seat when the lineman tightens the terminal bolt.

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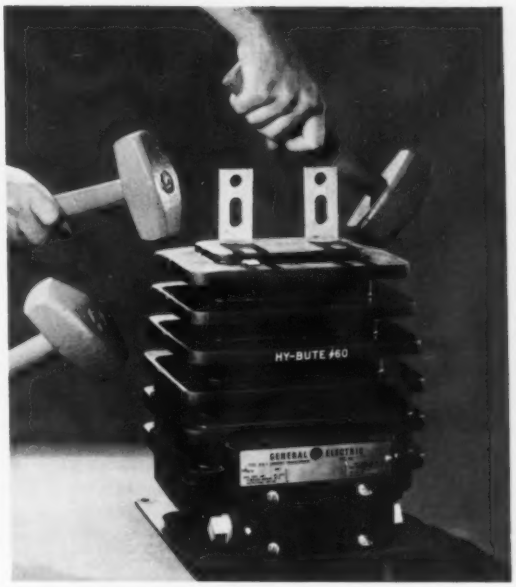
NOW Extra Values of Tough BUTYL . . .

. . . in 15 types of instrument transformers

Being tough, butyl supplies a lot of extra values to G-E instrument transformers. Some of these values are: longer life, safer operation, easier handling, simpler installation, and reduced maintenance.

On top of that, you'll get a certificate with each unit that certifies the transformer has passed insulation and accuracy tests.

The butyl family has been growing steadily. It now has 15 types. Current transformers completely cover the range from 600 volts to 15,000 volts, for indoor and outdoor service. And, potential transformers are now available for 5,000-volt service, both indoor and outdoor.



TELEMETERING

EXTRAS . . . in new equipment for 5–15 Cy per Sec

Now you can get a system that will transmit signals over low-cost channels. It's made possible by General Electric's new equipment for operation at only 5–15 cycles per second.

More than that, we can furnish a completely coordinated system, including a new wide-chart potentiometric recorder—all nicely packaged* on a panel or in a cubicle.

If you've been postponing telemetering because of high-cost transmission, give us an opportunity to quote on our new 5–15 cps.

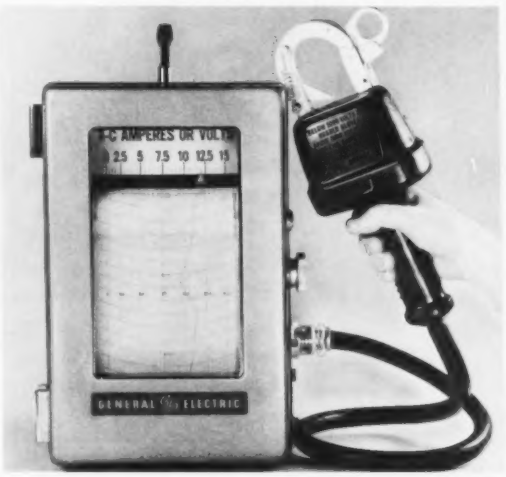
**Our ability to furnish the customer with completely packaged systems recently influenced two utilities to purchase General Electric telemetering systems.*

Also for Utilities

- **Switchboard Indicating Instruments**
- **Switchboard Recording Instruments**
- **Portable Indicating Instruments**
- **Portable Recording Instruments**
- **Automatic Dispatching Systems**
- **Leak Detectors (three types)**
- **Turbine Supervisory Instruments**
- **Reactor Instrumentation**
- **Automatic Time Switches**
- **Automatic Oscillographs**
- **A variety of Specialty Instruments**

NEW RECORDER FOR LOAD SURVEYS

Type CH-7



For surveys of loads that fluctuate rapidly, this instrument serves the best of any. With continuous inking, it responds fast and makes sharp, clear lines. With a spring-driven chart drive, it can be installed miles from nowhere. And, look, it just clamps on the line. Versatile, too; it has 6 current ranges—15, 30, 75, 150, 300, and 750 amperes.

In addition, you can also use it as a voltmeter. Ranges: 150/300/750 volts.

Consider, too, all the advantages of the CH recorder: throw-away inkwell, 60-day spring clock, two-month record rolls, and 28 possible chart speeds.

an EXTRA VALUE product feature

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Buy now—the new Form 3K arrester with

1000-Amp Long-Duration Discharge Capacity

The new G-E Form 3K station-class arrester helps your system meet the rapid changes coming in the next decade and provides premium operating characteristics at today's standard price levels. G.E.'s proven Magne-valve principle gives the 3K a 1000-ampere long-duration discharge capacity 570% greater than industry standards, and an improvement of 54% over G.E.'s popular Form 1H arrester. You can confidently adopt the Form 3K for use with two-step reduced BIL insulation for lightning currents in excess of 30,000 amperes through the arrester. Full operating and installation information is available at your General Electric Sales Office.

Revolutionary gap design has no coils or magnets

An extra-capacity Thyrite* valve ring is the key to the Form 3K arrester's long-duration discharge capacity. This Magne-valve action is shown in the diagrams below and occurs in this sequence:

1. GRADING CURRENT

Under normal voltage conditions, Thyrite gap shunting resistor gives uniform voltage distribution across entire stack.

2. IMPULSE CURRENT

Lightning and switching surges jump main gap and discharge to ground through Thyrite valve element. Pre-ionizer gives uniform sparkover.

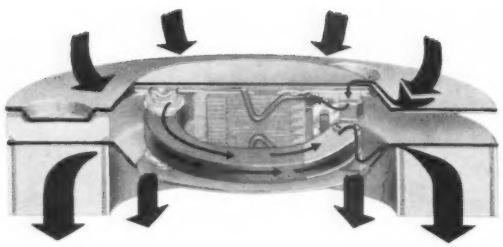
3. INITIAL POWER FOLLOW CURRENT

The magnitude of the power frequency follow current is limited by resistance of Thyrite elements. Gaps begin to extinguish current.

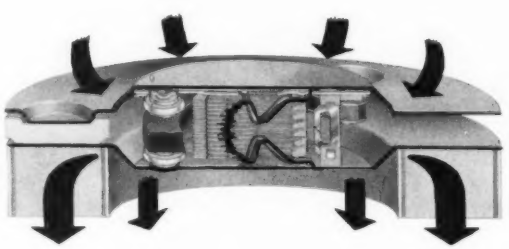
4. POWER FOLLOW CURRENT INTERRUPTION

Arc moves toward free end of horn gap, reinforced by flux action in auxiliary plates, breaking into 15 separate arcs.

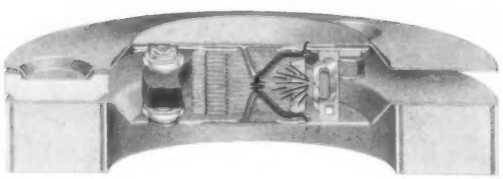
*Reg. Tradename of G.E. CO.



1. GRADING CURRENT



3. INITIAL POWER FOLLOW CURRENT



2. IMPULSE CURRENT

4. POWER FOLLOW CURRENT

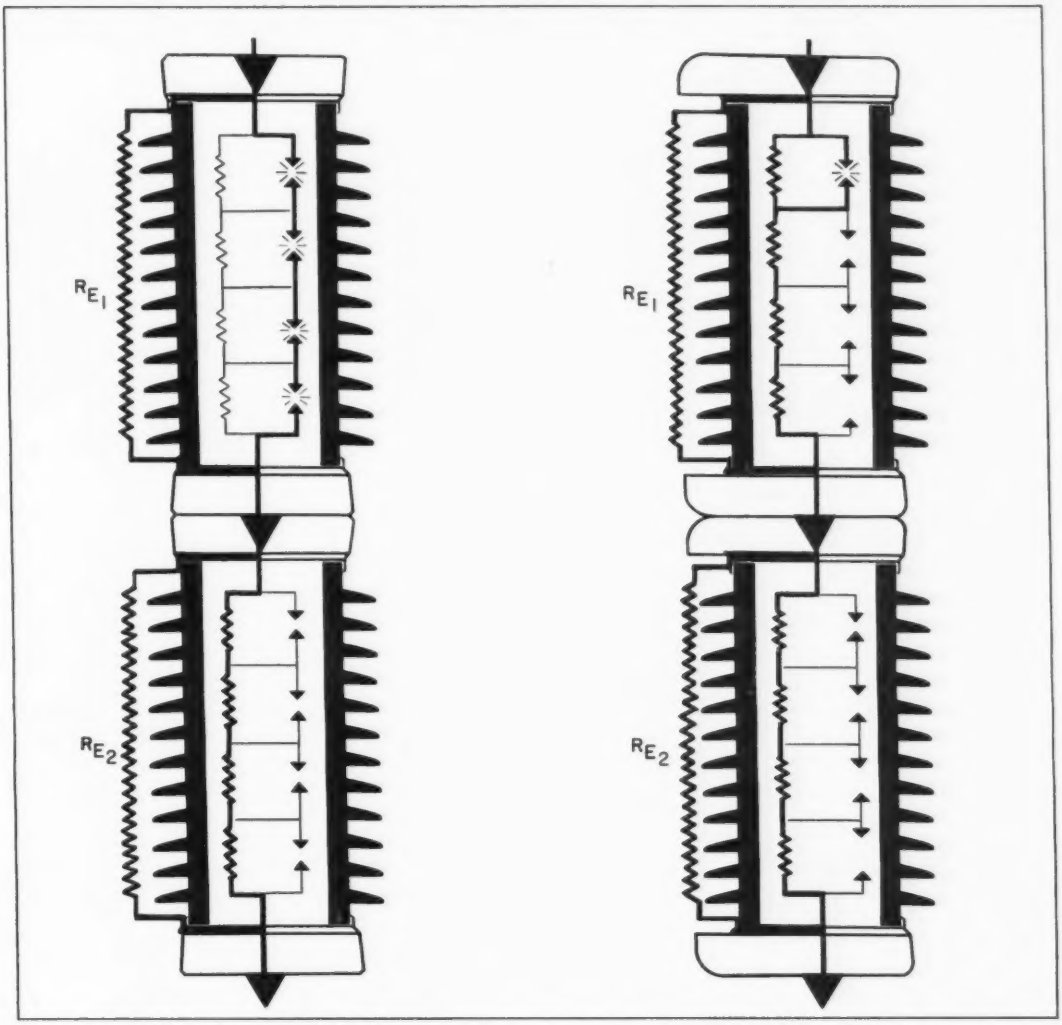


Fig. 1. Conventional Arrester

Fig. 2. G-E Form 3K Arrester

Anti-contamination Design

When arrester porcelain is contaminated, leakage current increases over the external path (R_E in figures above). Resistance drops on the wet surface, rises as it dries. Uneven drying causes an uneven voltage gradient over the stack. In ordinary arresters, internal gaps are evenly spaced. When one sparks, others on that unit follow, removing this unit from service, as shown in Fig. 1 above. If uneven drying continues to cause arrester sparkover, this could lead to a runaway condition resulting in arrester failure.

The new G-E Form 3K station arrester overcomes this fault with graded gap spacings. When contamination causes the voltage to jump the smallest gap, the others, having greater spacing, remain in service as shown in Fig. 2. The unit's resistance then more nearly matches the others, restoring uniform voltage distribution.

Burn-through pressure relief diaphragms, exclusive with G-E arresters, provide safe operation in the remote event of failure. Top and bottom apertures vent hot, pressurized gasses and form an external conducting path.

Ask for complete details on the Form 3K station arrester at your General Electric Sales Office, or write General Electric Co., 431-76, Schenectady 5, N. Y.

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OPERATION upturn — Buy now for extra values — GENERAL ELECTRIC

NOW IS THE TIME

How General Electric capacitors can pay for themselves by reducing your operating costs

You can expect a 25 to 45% annual return on your investment when you buy General Electric power capacitors*. G-E capacitors can pay for themselves within two to four years, and can go on producing savings year after year after year. Such a high return on investment is possible because 50-Kvar units are now priced as low as $3.11 per Kvar, with switched capacitor equipments as low as $4.15 per Kvar. As a result, capacitors are now a more economical source of kilovars than ever before, especially in view of the high cost of generating and transmitting this commodity from your power stations.

Capacitors you add to your system can:

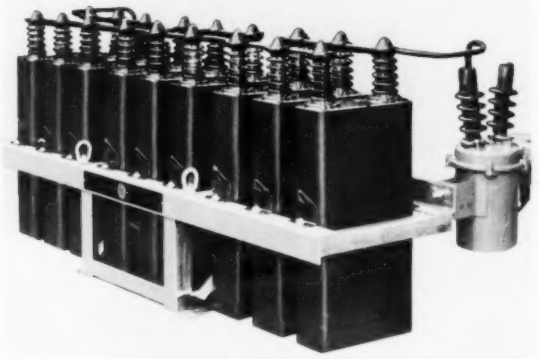
1. REDUCE KILOWATT-HOUR LOSSES. On a system operating at 90% power factor, you can expect each 50-Kvar capacitor located in the distribution area to eliminate 8500 Kw-hrs. in losses per year.

2. IMPROVE SYSTEM VOLTAGE LEVEL and allow more KW load to be served. Generally, over one-half of system voltage drop is caused by kilovar flow. Engineering studies show that, from a voltage-drop standpoint, system loading can be increased one KW for each Kvar installed in the load area.

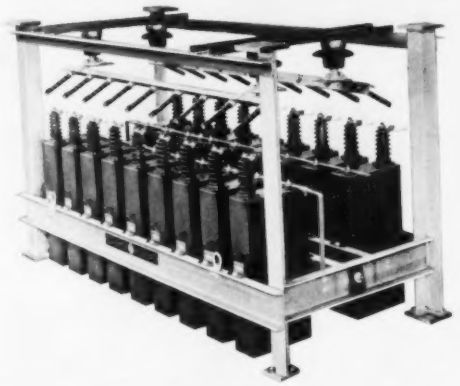
3. RELEASE THERMAL CAPACITY. By eliminating kilovar flow through transformers and other thermally limited equipment, capacitors will allow you to serve more pay load with existing equipment. For example, capacitors added to a system operating at 90% power factor will release nearly 20 KVA of thermal capacity per Kvar capacitor.

To begin producing these savings immediately; to help you handle present and future loads more economically; and to get extra value from your investment, now is the time to buy General Electric power capacitors. Contact your General Electric Apparatus Sales Engineer or write to Section 431-76, General Electric Co., Schenectady 5, N. Y.

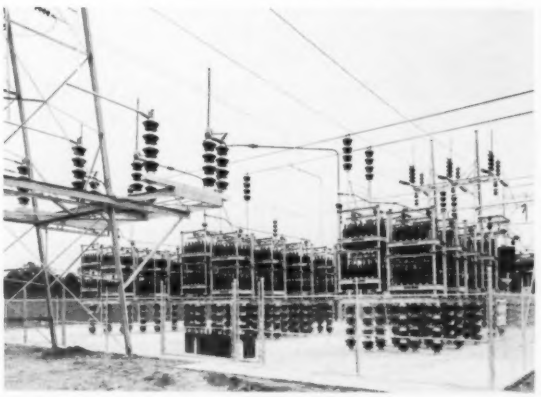
** Ask your General Electric Apparatus Sales engineer to show you the investment return capacitors can produce on your system.*



1. CORROSION-RESISTANT ALUMINUM RACKS provide their own protective coating. The framework of G-E open rack capacitor equipment like that of this pole-top bank will not require painting, even in the corrosive atmospheres of industrial or coastal areas. Accessories can be added in the field by simply drilling or tapping the aluminum frame; no protective touch-up is necessary.



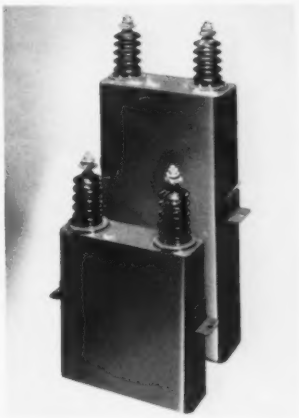
2. FAST, EASY INSTALLATION is possible with General Electric's complete line of factory-assembled capacitor equipments. Corrosion-resistant capacitors, fuse-holders and buswork have been pre-assembled in this lightweight aluminum stack rack to reduce your installation time and costs, thus giving you extra values.

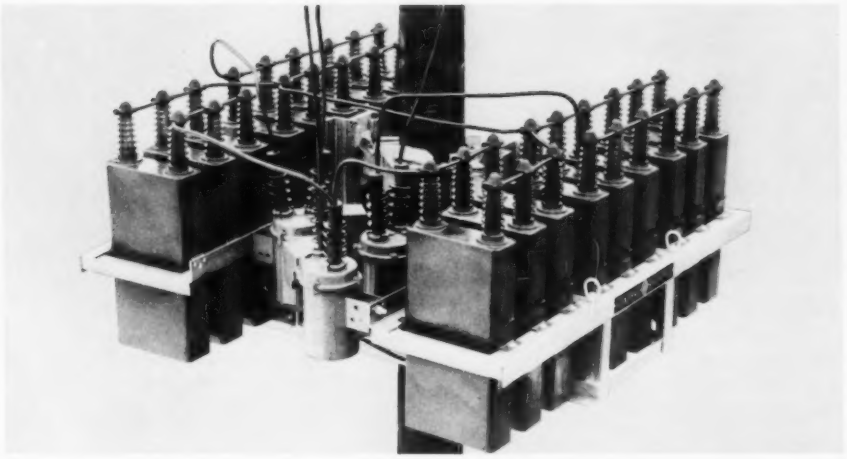


3. ENGINEERING SERVICES CONTRIBUTE EXTRA VALUE in every purchase of General Electric power capacitors. General Electric helped solve a customer's system problem by designing this high-voltage series capacitor installation. The tailor-made installation provides an economical balance of power flow over parallel lines.

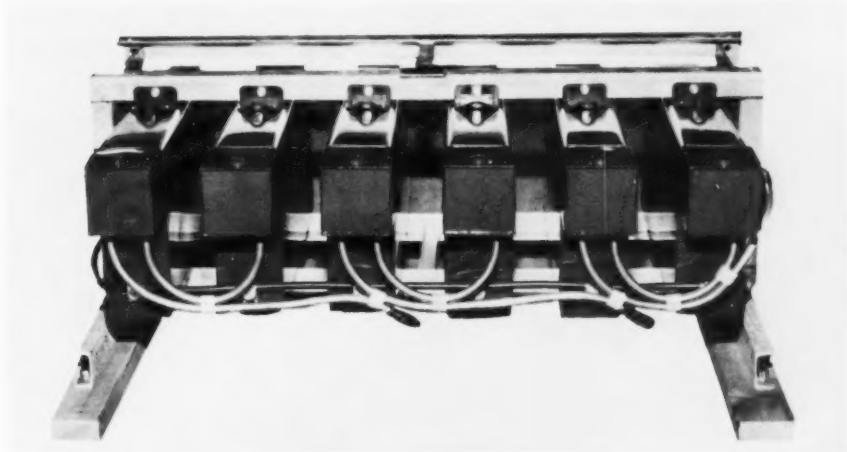
Seven Extra Features in Capacitor Equipment Help Reduce Maintenance and Improve Service

Ask your General Electric apparatus salesman for complete details on these extra features





4. NEW POLE-TOP CAPACITOR EQUIPMENT IS BALANCED, EASY TO INSTALL. For larger capacitor banks on distribution feeders, a new G-E cluster-type, pole-top capacitor equipment is now available in ratings as high as 1200 Kvars. Perfect balance of this equipment means there is practically no bending moment on pole. It's quick and easy to install—a compression-type bracket squeezes the pole, eliminating the need for drilling and bolting. FKC oil switches can be located close to pole, in easy reaching distance for linemen. Structural material of corrosion-resistant aluminum is lightweight and requires no maintenance.



5. UNDERGROUND ENCLOSED CAPACITORS RESIST SUBMERSION. To help provide capacitor kilovars where there is no available pole space on an overhead system, or for entire systems underground General Electric developed this primary equipment for installation in vaults or man-holes subject to submersion. It is also ideal for surface applications in contaminated atmospheres where exposed bushings would become coated with conducting materials, or where clearances from live parts to buildings or personnel would not be adequate as with some other types of conventional capacitor equipment.

6. VIRTUALLY NO PAINT MAINTENANCE is required on General Electric power capacitors. The tough, corrosion-resistant case of these 50 and 25 Kvar units, and that of residential secondary capacitors, too, withstands rain, snow, salt-fog and contaminated atmospheres, and will not require protective repainting. To prove the durability of G-E capacitor case material, it was subjected to a salt-fog test in the General Electric Capacitor Department's Advance Materials and Development Laboratory. After 4768 hours, it showed not the least trace of corrosion or rust.

7. NEW SERIES CAPACITOR AIDS TRANSFORMER UTILIZATION. Increased loading of your distribution transformers is possible with this new low-voltage series equipment. Consisting of a secondary capacitor and protective gap, this equipment makes a distribution transformer virtually self-regulating. The gap, which prevents excessive voltages from occurring on the capacitor and transformer, removes the capacitor from the system under abnormal voltage conditions, and re-inserts it when normal voltage is restored. The corrosion-resistant capacitor case, stainless steel gap and alumina ceramic bushing and insulator contribute to the long, useful life of this secondary series capacitor equipment.

40,000-KVA, 230-KV MOBILE TRANSFORMER is latest evidence of General Electric progress in increasing mobile capacity while holding the line on size and weight. General Electric mobile equipment, used for maintenance or reserve capacity or to serve temporary or peak loads, means important savings in system operating costs. Many utilities are finding that larger ratings are providing ever larger savings.

PROGRESS IN G-E POWER TRANSFORMERS THAT PAYS OFF . . .

Mobile Transformer Rated 40,000 kva

Many utilities benefit with new higher-rated mobile substations and transformers as General Electric holds the line on size and weight

General Electric has spearheaded a major advance in the design and manufacture of mobile substations and transformers in the past few years. Only recently 5000 kva was considered huge for this apparatus. This year, in the 7500- to 40,000-kva range, G.E. has built or is actively working on more than a dozen mobile substations and transformers!

Innovations now in development will mean that this trend to higher ratings can continue for years without exceeding highway limiting dimensions. A better understanding of weight problems between the utilities and state and local authorities will also contribute to the wider application of mobile apparatus.

Mobiles are being used more and more as maintenance tools, as reserve capacity, and as a means of serving temporary or peak loads. The new, higher-rated G-E mobile subs and transformers magnify these areas of savings for utilities.

For information on how G-E mobile apparatus can help improve your system operating economy, contact your G-E Apparatus Sales Office, or write Section 431-76, General Electric Co., Schenectady, N. Y.

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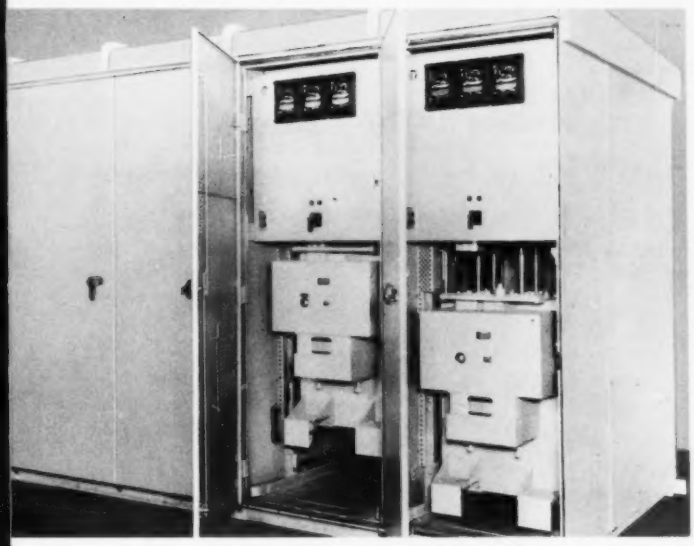
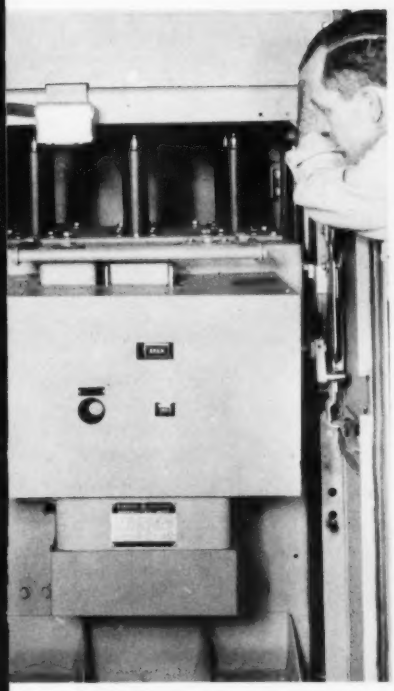
Creative Design Engineering Puts Extra Values in General Electric Metal-Clad Switchgear



A new design for General Electric's outdoor metal-clad switchgear typifies the engineering creativity which means extra values for you. Design resourcefulness now brings you these extra values in outdoor metal-clad:

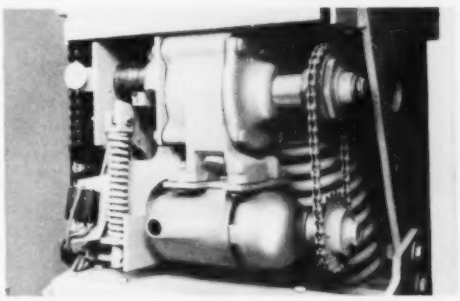
- **ONE-MAN OPERATION** and maintenance—all operations are conducted from the front of the switchgear, since control and protective devices are panel-mounted above the breaker.
- **SMALLER FOUNDATION SIZE**—rear aisle is eliminated, pad size reduced.
- **SIMPLIFIED FOUNDATION CONSTRUCTION**—power conduit need not be imbedded in pad.
- **EASIER INSTALLATION**—no skidding of switchgear over stubbed power conduit in foundation.
- **ALL-WEATHER MAINTENANCE**—a protected aisle is optionally available to shield your maintenance crew from inclement weather.

After checking these, and the other extra values on this page, call your General Electric Apparatus Sales Engineer for the details.

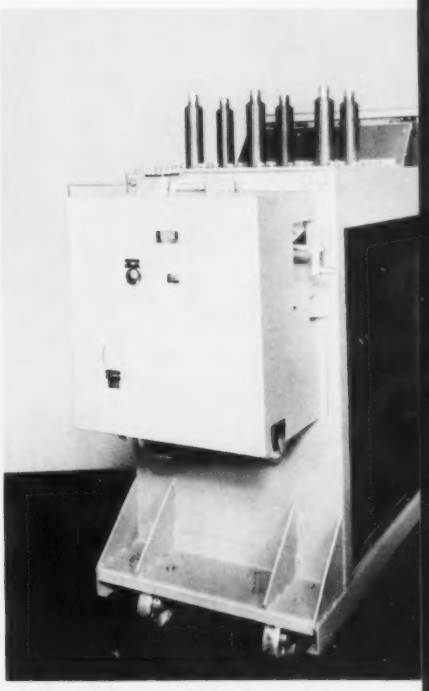


VISIBLE SAFETY for your operating personnel is a product of G.E.'s unique vertical-lift design. Operator actually sees when contacts part, and lower center of gravity cuts danger of breaker tripping.

FLAME RETARDANT SELF-X insulation, which will not support combustion and extinguishes itself almost immediately, is typical of G-E insulation advances.



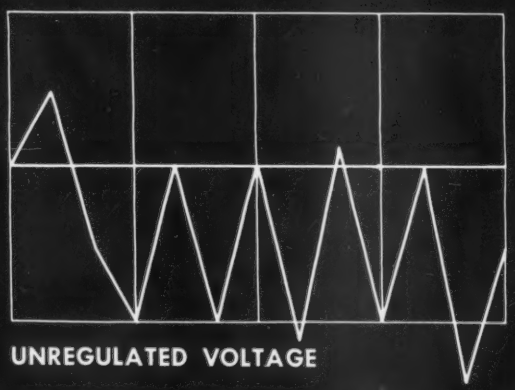
CONTROL POWER SAVINGS up to 90% can be realized with General Electric's optional stored-energy closing device. Another extra value—quicker, safer, manual operation and re-charging in the event of control power failure—more examples of creative design engineering.



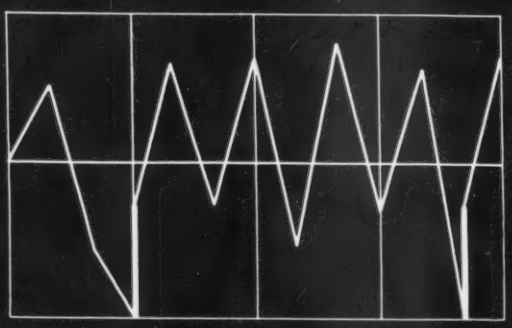
LATEST ADDITION to G.E.'s Metal-clad Switchgear line is the 1000-mva breaker. Complete line now includes ratings 2.4 to 13.8 kv and 75 to 1000 mva, and two-cycle interruption at 4.16 and 13.8 kv.

an **EXTRA VALUE** product feature

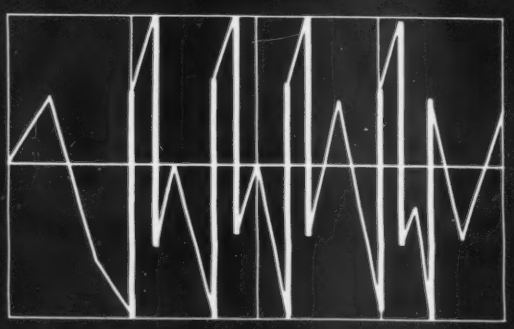
OPERATION **up turn** Buy now for extra values GENERAL ELECTRIC



UNREGULATED VOLTAGE



5/8% STEPS

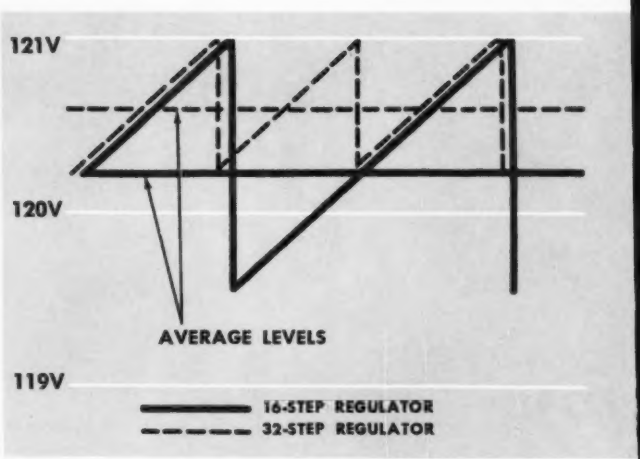


1¼% STEPS

The value of 32-step regulators

In actual practice, 32-step regulation offers the optimum *combination* of economy and well-regulated voltage. Here's why . . .

32-STEP REGULATION MEANS . . . . .



16-STEP ADVOCATES select the profile above to prove fewer operations, better average voltage. This assumes that voltage always changes in same direction. Actually, your system voltage fluctuates up *and* down. Realistic examples at left clearly show the facts. Thick, vertical lines indicate frequency of tap switch action.

32-step regulators provide closer regulation, longer life

32-step regulators on a typical feeder can be set to hold a closer bandwidth (a measure of profit and service) with less problem to the utility. This is true, although bandwidth should always be set greater than the size of the step in order to have stable operation of controls and to avoid hunting. Hence, with the same amount of desirable time tolerances (to avoid unnecessary operation), a narrower bandwidth can always be set on units having a smaller step size.

Even with holding effect, which provides assurance against undue relay contact wear and unnecessary switch operation, General Electric regulator controls can be set to hold a minimum bandwidth of between ± ¾ and ± 1 volt. Because of control accuracy—even Class 1—it is impossible for any 32-step or 16-step regulator to hold a true ± ¾-volt tolerance *on the line*. It is highly improbable that field adjustment of 16-step regulators will result in a 2- or even 3-volt tolerance *on the line* because of normal control and human inaccuracies imposed upon a 1½-volt step.

By noting the conditions common to many systems (the three charts at the left), the superiority of 32-step regulation may be seen in terms of reduced operation on average, not "selected" feeders.

The G-E ML-32 need not be untanked for inspection until after the prescribed number of operations—normally covering 20 years or more. One reason: smaller tap voltages mean less electrical wear (contact erosion) per tap change because contact erosion is approximately proportional to tap voltage. Physical wear, on the other hand, has been proven to be relatively insignificant—by test and actual field practice. Five-eighths per cent steps on the ML-32 result in less rupture voltage.

The G-E ML-32 will operate successfully under short circuits of 25 times normal *during* tap changes at any Load Bonus position. Tip life is co-ordinated with the insulation so that the oil does not have to be serviced during the life of the contacts.

Your G-E sales engineer has complete details on why G-E 32-step regulators cost less on the line. General Electric Co., Schenectady, N. Y.

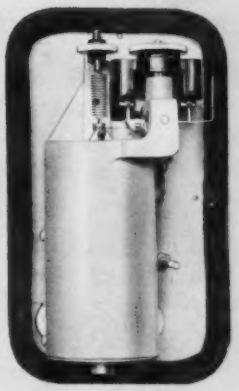
423-28

Progress Is Our Most Important Product

GENERAL ELECTRIC

. . *General Electric regulators cost less on the line*

ML-32 VRR WILL HOLD ± ¾ V BAND



CLOSER BANDWIDTH means savings in system operation. With the 32-step regulator, a 1½-volt band is easily set and because of time tolerances will be maintained at 2 volts or less. Attempts to hold 2 volts with a 16-step regulator could result in endless hunting.

ML-32 TDR ADJUSTABLE FROM 10–120 SECONDS

TIME DELAYS of 30 seconds are preferred by most utilities. ML-32 integrated time delay can be set *as desired* for a wide range of time delays (10-120 sec.). Result: Greater ease of control adjustment, greater operating economy, and a better *balanced* job of voltage regulation.

Extra Value in Enclosed and Open Dropout Cutouts

100-AMP ENCLOSED FUSE CUTOUT, with gas loadbreak cylinder, can now replace more expensive switching devices. As the door is opened, a high-pressure blast of insulating gas automatically extinguishes a full-load power-current arc in 3 to 7 cycles. Replacing the used cylinder is simple and can be done on the pole in moments.

10,000-AMP INTERRUPTION rating at 7.8 kv, and 8,000 amperes at 15 kv extends the usefulness of this new G-E extra-heavy-duty open dropout cutout. Double venting action of fuse tube clears high currents through expendable cap at tube top and normal venting at bottom. Low currents are cleared through optimum bore size and venting fuse tube at bottom only. Full information on the economies of cutouts are available at your General Electric Sales Office.

Free Publications on Transmission and Distribution Equipment with New Extra Values

DISTRIBUTION TRANSFORMERS

10 Reasons Why General Electric Is Your Best Transformer Buy—GEA-6070C.
Self-protected Distribution Transformers—GEA-6126B.

INSTRUMENTS

New Butyl-molded Potential Transformers—GEA-6810.
Telemetering Systems—GEA-5233.
General Purpose Recorder—GEC-1319.

LIGHTNING ARRESTERS AND CUTOUTS

New Form 3K Station Arrester—GEA-6794.
Secondary Lightning Arresters—GEA-2977E.
Open Dropout Fuse Cutouts—GEA-1816L.
Flip Open Fuse Cutouts—GEA-4224E.

CAPACITORS

Power Capacitors—GEA-6662.
Stack-Rack Capacitor Equipments—GEA-6796.
Pole-Top Auto-Switch Capacitors—GEA-6543.
Fixed Pole-Top Capacitor Equipments—GEA 6657.
Residential Secondary Capacitors—GEA-6670.
Protective Gaps for Positive Protection of Series Capacitors—PT-26.

MEDIUM VOLTAGE SWITCHGEAR

Metal-Clad Switchgear—GEA-5664.

FEEDER VOLTAGE REGULATORS

ML-32 Step Voltage Regulators—GEA-5752.
ML-32 Step Voltage Regulators Application Guide—GED-3468A.

POWER TRANSFORMERS

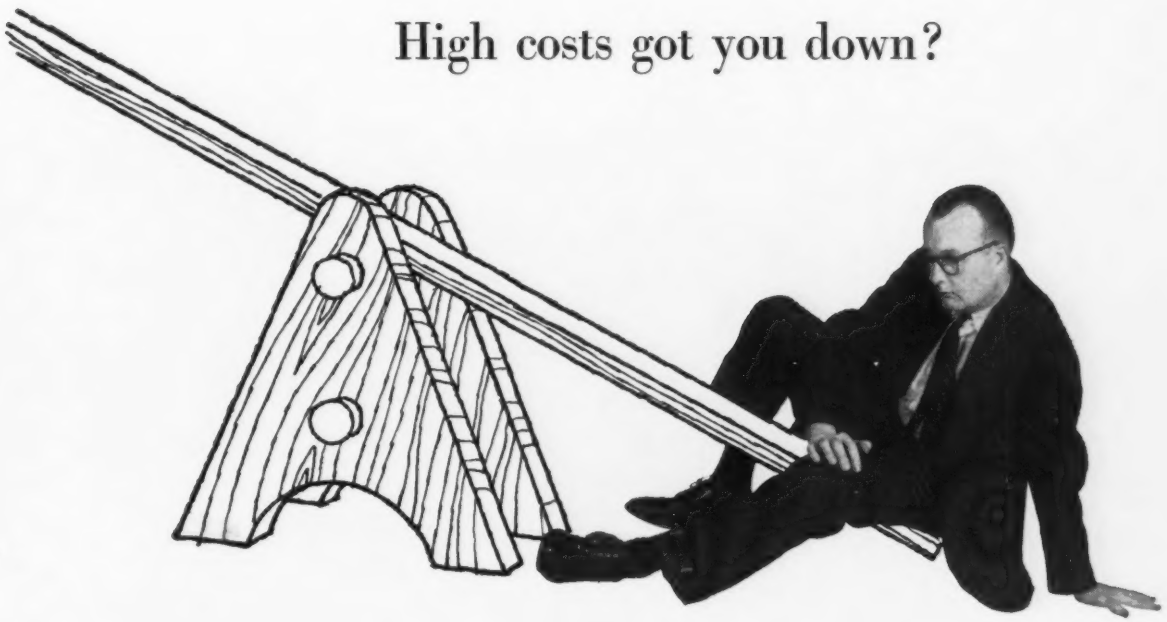
Mobile Unit Substations and Mobile Transformers—GEA-4415.

Any of the above publications may be had at no cost by writing the General Electric Co., Section 431-76, Schenectady 5, N. Y.

LIVE BETTER ELECTRICALLY

Progress Is Our Most Important Product

GENERAL ELECTRIC



See how you can save on electrical equipment maintenance with

Shell Diala Oil AX

the modern insulating oil

Switch to Shell Diala Oil AX and three things happen to improve your cost picture.

First—and case histories prove this—you get far longer service life from your electrical equipment.

Second—you extend the interval between costly maintenance checks.

Third—you use less oil.

Savings like this are possible because Shell Diala AX's unique qualities make it far more effective, *far longer*, than ordinary insulating oils. The secret is a Shell-developed oxidation-inhibiting agent incorporated in an oil specifically refined for inhibiting. So effective is this combination, accelerated tests in Shell research laboratories show Diala AX undergoes no appreciable deterioration in a period equal to 50 years of normal use. Years after ordinary oils fail, this insulating oil is still acid and sludge-free.

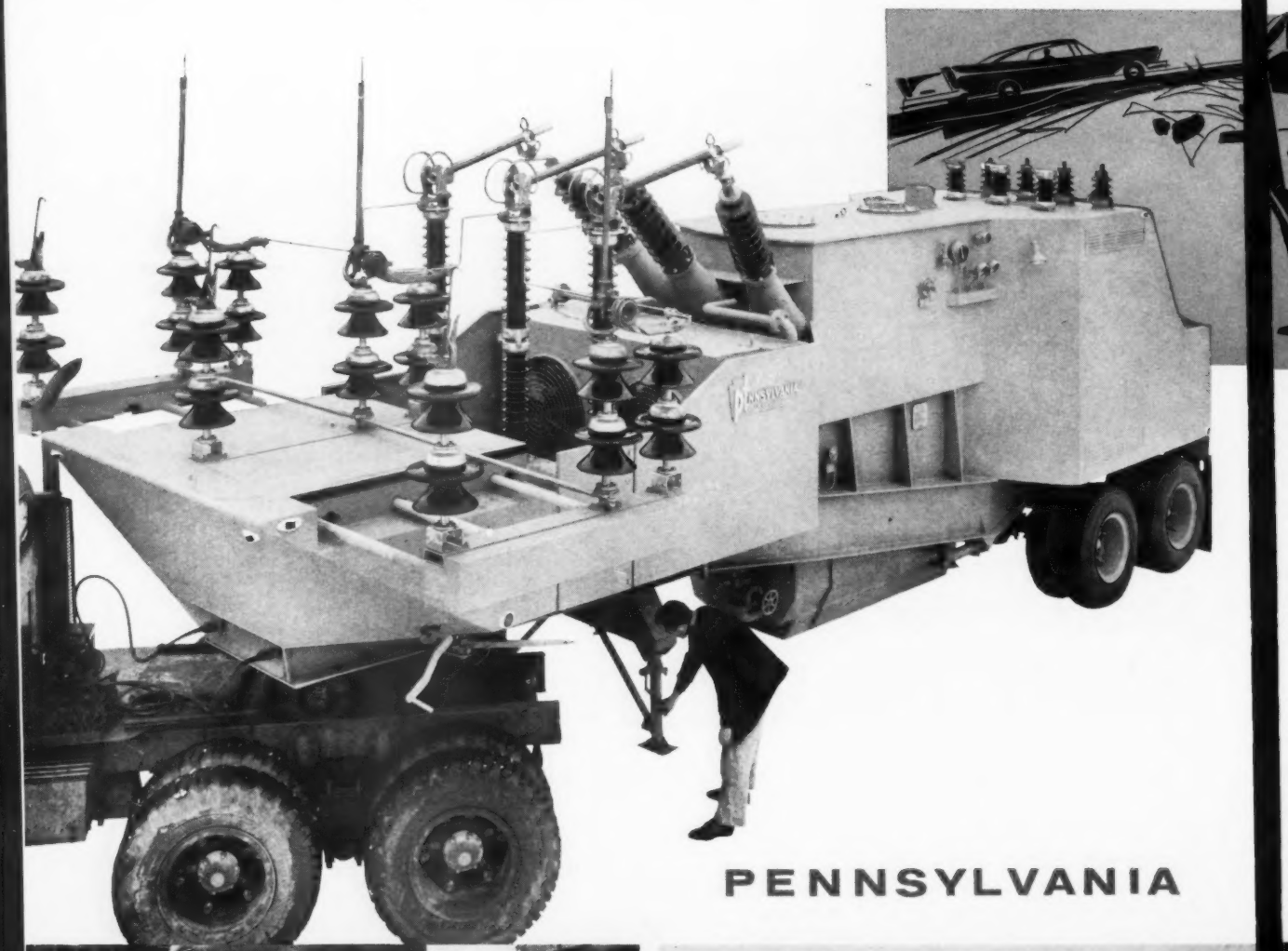
Put Shell Diala Oil AX to work protecting your electrical equipment. Call your Shell representative.

SHELL

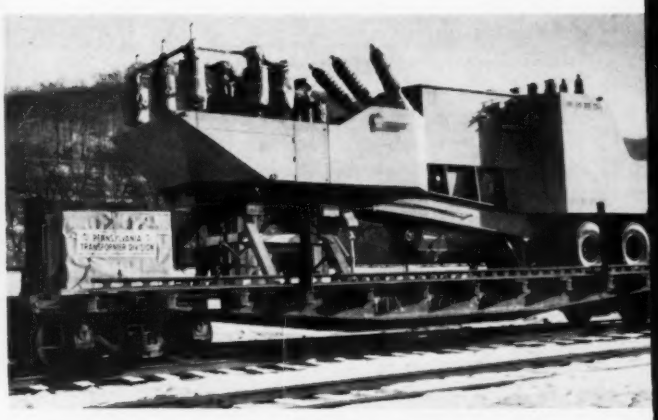
SHELL DIALA OIL AX

- ✓ **Special oxidation inhibiting agent makes it unusually resistant to oxidation**
- ✓ **helps metal parts resist corrosion**
- ✓ **helps insulation resist deterioration**
- ✓ **remarkable stability**
- ✓ **low viscosity**
- ✓ **low volatility**
- ✓ **high flash and fire points**
- ✓ **low pour point**
- ✓ **high dielectic strength**
- ✓ **excellent demulsibility**

NEW 15000 KVA PENNSYLVANIA

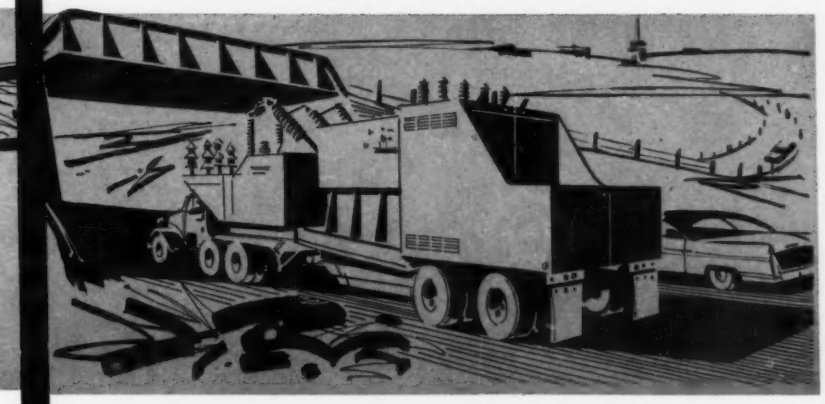


The rear compartment and platform of Pennsylvania's new Transmobile provide easy access to the low voltage circuit breaker, control equipment, metering devices, etc.



Shipped by rail, the Transmobile was unloaded by backing a tractor under the trailer and driving it down a ramp. The 15000-kva unit was shipped fully assembled.

MOBILE SUBSTATION meets normal highway clearances . . .



Pennsylvania "Transmobile" speeds complete substation service wherever it's needed

One of the highest-capacity mobile substations in the United States now rolls over the highways of a southwestern utility to wherever it is needed for emergency or maintenance service. This substation on wheels, a new Pennsylvania Transmobile, also serves as a replacement unit for the utility whenever permanent facilities are being altered or enlarged.

Designed and built by Pennsylvania Transformer, the three-phase, 15,000-kva Transmobile has a high voltage of 64,400△ volts, with two full-capacity taps above and two below normal. The low voltage is 12,470Y/7200 volts.

The substation includes a high voltage air-break switch, which is retractable when the Transmobile is being moved, high voltage and low voltage lightning arresters, metering and auxiliary power transformers, metering current transformers, a low voltage oil circuit breaker, a phasing transformer, and high voltage fuses.

Mobility of the Pennsylvania Transmobile is excellent, despite its high capacity and complete complement of substation equipment. With high voltage fuses removed, all three dimensions meet normal highway clearances. Only the weight exceeds normal highway limitations—but the total weight is well within the maximum agreed upon between the utility and the state.

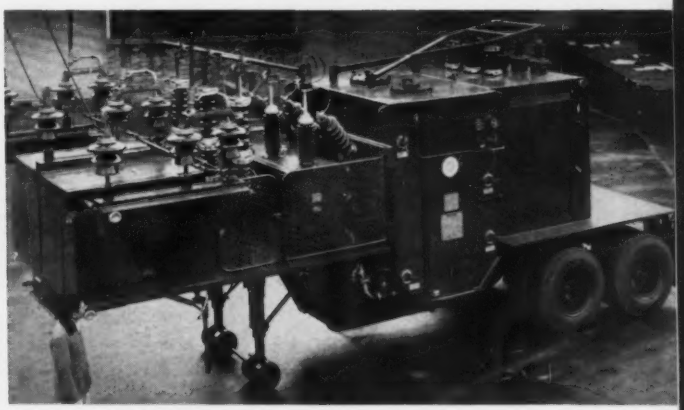
Pennsylvania Produces All Types and Sizes of Custom-Designed Mobile Substations

Putting power on wheels is nothing new for Pennsylvania Transformer, whose experience with mobile units ranges from small distribution transformers to fully equipped substations like the one shown. A 15,000-kva mobile autotransformer (138—69 kv) is now under construction for the same southwestern utility.

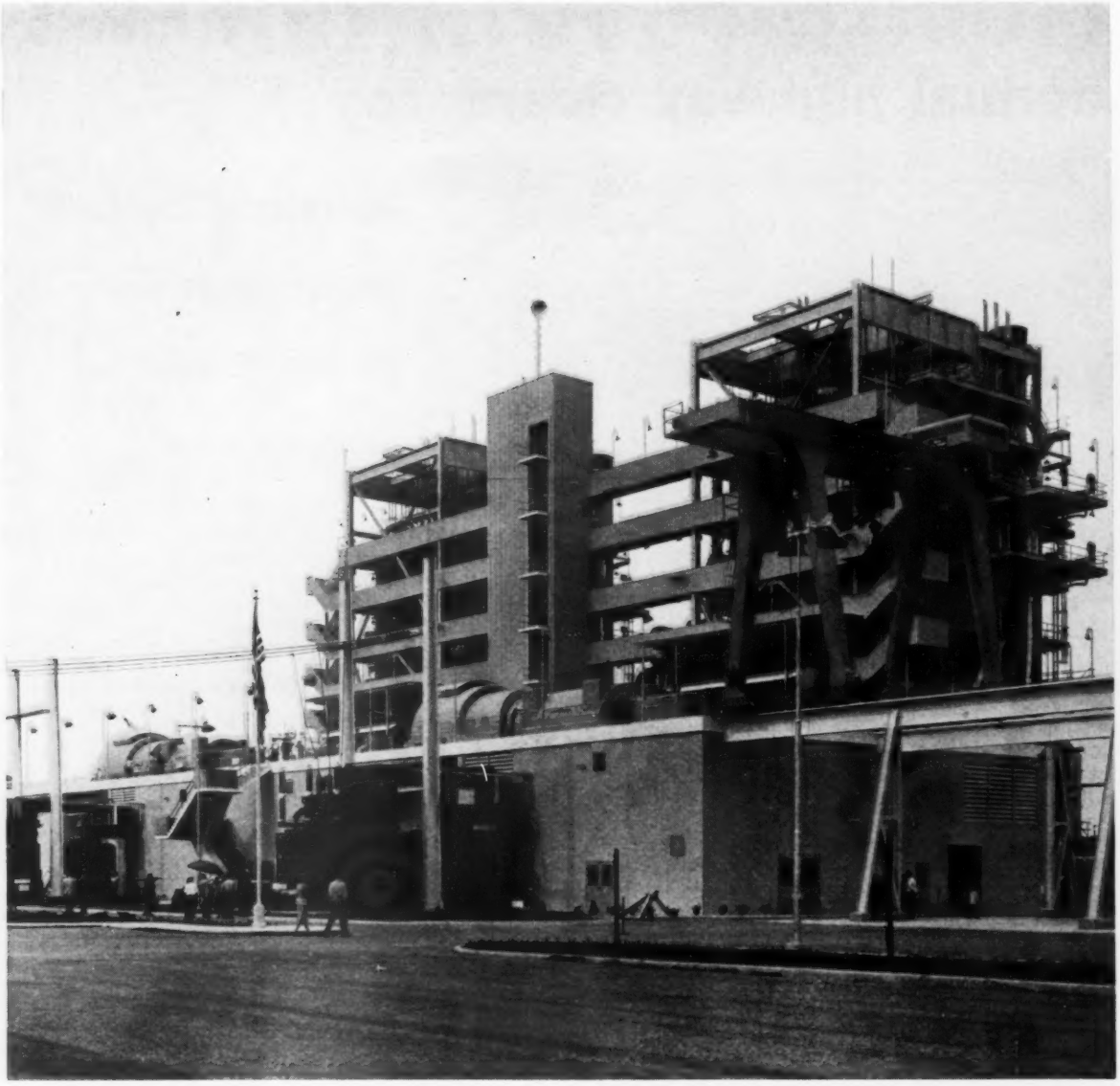
If you are considering adding mobility to your own system, a consultation with Pennsylvania's experienced engineers will not obligate you in any way. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

POWER TRANSFORMERS

5000 KVA PENNSYLVANIA MOBILE SUBSTATION
High voltage: 11500△ x 34500 volts. Low voltage: 2520/4360Y/2520 x 7560/13090Y/7560 volts.



3750 KVA PENNSYLVANIA MOBILE SUBSTATION
High voltage: 25700 x 51400△ volts. Low voltage: 2520/4360Y/2520 x 5040/8720Y/5040 x 7560/13090Y/ 7560 volts.



MORE POWER FOR ARIZONA'S GROWTH

Agua Fria Steam-Electric plant, recently completed at Glendale, Arizona, for the Salt River Power District provides more electric power for the Southwest's rapidly expanding needs.

The plant is a two-unit installation, capable of producing up to 230,000 kilowatts. Simplicity of design and the pleasing appearance of plant and landscaping make it an attractive addition to the Phoenix area.

Bechtel designed, engineered and built Agua Fria, working closely with Power District engineers. Bechtel also engineered and built the District's 100,000-kilowatt Kyrene Steam Plant, completed in 1954.

BECHTEL CORPORATION
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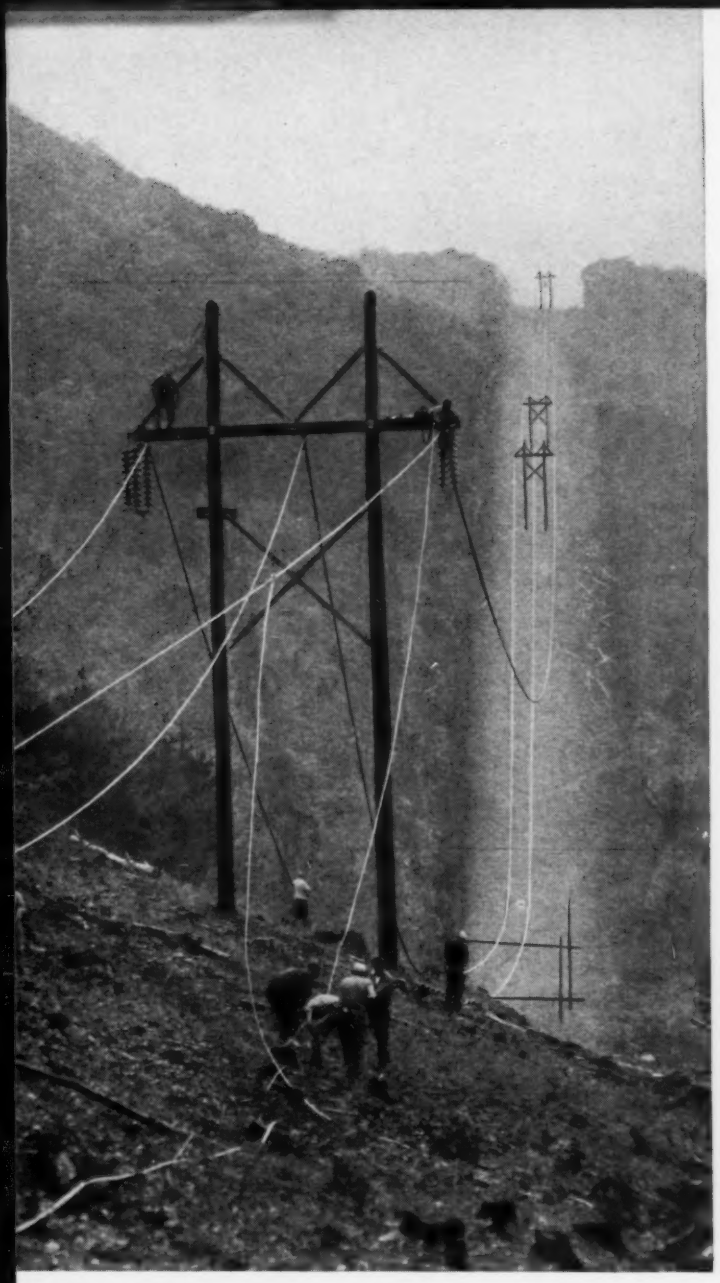


When a job calls for ACSR ...it calls for Anaconda cable experience

Producing top quality transmission cable requires more than a ready supply of metal—copper or aluminum. The most vital ingredient of good cable is the manufacturer's *cable experience.*

The choice of metals may change, depending on economic or other considerations. But cable requirements and the skills and knowledge involved in making dependable transmission lines do not. Whether copper or aluminum . . . it will pay you to call on the Man from Anaconda.

Backed by the broadest line of wire and cable in the industry, in both copper and aluminum, he is best qualified to help you arrive at the most practical and economical answer to your cable needs.

Multi-mill manufacturing facilities – strategically located across the country – assure speedy service. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

FASTEST WESTERN SERVICE – At Orange, California, Anaconda's expanded, modernized mill fabricates and stocks copper and aluminum wire and cable for *every type of application.* Anaconda's Western Distributors thus can assure the fastest possible service on all West Coast needs. See Anaconda Sales Offices: Los Angeles, San Francisco, Seattle, Denver.

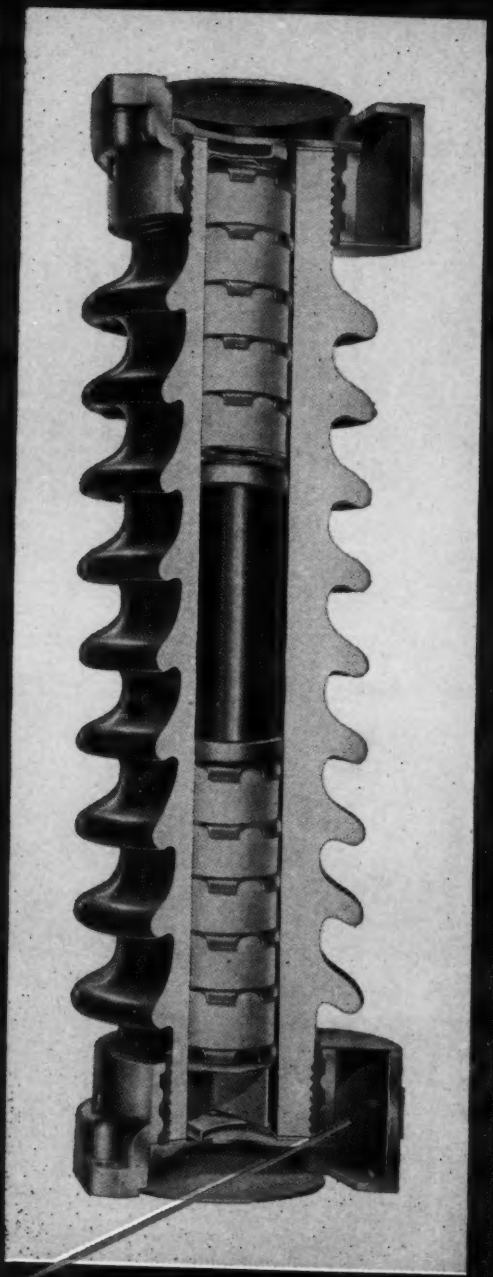
SEE THE MAN FROM ANACONDA®
FOR ALUMINUM WIRE AND CABLE

HIGHWAY FOR POWER. Anaconda 336.4 Mcm ACSR installed through rugged Catskill Mountains by New York State Electric & Gas Corporation.

LINEMAN *(below),* standing near slowly revolving reels of cable, uses sound-powered phone to talk to cable-pulling crew about one-half mile away.

BULLDOZER *(lower left)* pulls cable from 4 or 5 reels up and over 5 pole dead end and on to the next H structure. "Cat" had to let itself down mountainside by winch.

57387



Exclusive Westinghouse venting transfers arc outside in less than ½ cycle.

FROM PLOWBACK OF EARNINGS INTO RESEARCH

ARRESTER EXPLOSION PREVENTED BY ARC TRANSFER

Westinghouse engineers developed a unique arc transfer method which completely eliminates the possibility of arrester explosion and the resulting damage.

If an arrester does not clear the power follow-current after sparkover, full system short circuit current will flow through the device, with the resulting build-up of tremendous pressure. Unless this pressure is stopped within ½ cycle, the arrester will explode and damage adjacent equipment. Westinghouse engineers in 1950 combined a rupturing diaphragm with exhaust ports which transfer the arc to the outside of the porcelain in less than ½ cycle.

In 1954, after four years of perfect field trials, Westinghouse began applying this pressure relief device to all station arresters.

For complete information about the extra margin of safety in Westinghouse station arresters, call your Westinghouse sales engineer or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-60947

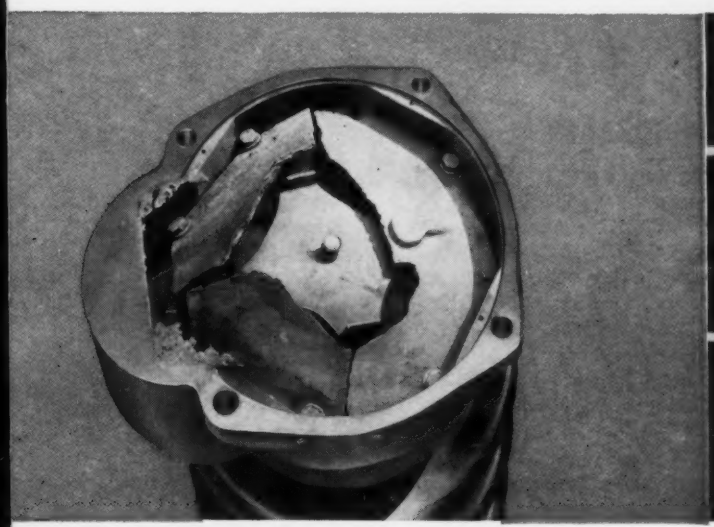
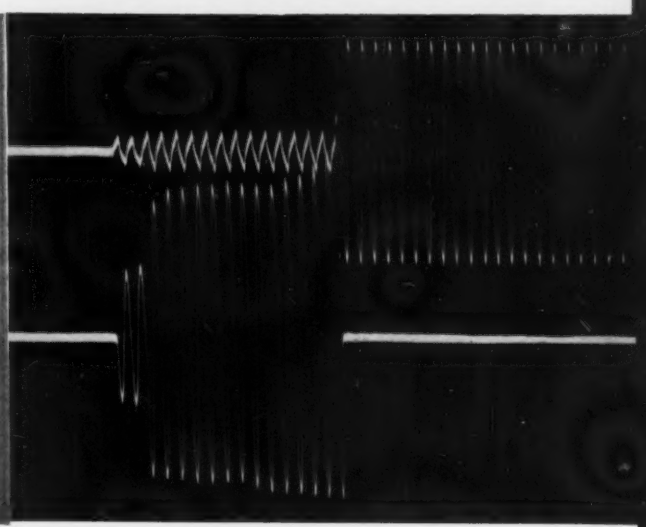


Illustration shows fractured diaphragm of arrester purposely damaged at High Power Lab to create high gas pressure. Vents at either end of the arrester units direct the gas, after rupture, to the outside of the porcelain . . . this path of ionized gas requires considerably less voltage to maintain the arc than in arrester interior . . . thus the arc is transferred outside to the ionized path created by the gas jets. Action requires less than ½ cycle from onset of full fault current.



Oscillogram illustrates action during high fault on damaged SV station arrester equipped with the Westinghouse pressure relief device. After surge was applied to arrester, 42,000 amperes rms of short circuit current started to flow through the unit, and voltage dropped to about 33% of normal crest. After about *15% of one cycle*, voltage dropped to steady-state a-c arc voltage . . . indicating that ionized gases conducting the arc merged outside the arrester porcelain.

YOU CAN BE SURE... IF IT'S Westinghouse

SMOOTH BORE!

Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

WRITE DEPT. WE-88 FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT

Another fine product!

Underfloor Duct by ORANGEBURG®

For Distribution of Electrical Wiring in Commercial, Industrial and Institutional Buildings

Since 1921 Non-Metallic Underfloor Duct by Orangeburg has been selected for many of the country's outstanding buildings because of its safety, flexibility and low installed-cost. To learn how an Orangeburg Underfloor Duct System keeps a building *electrically* modern for its lifetime, write for Catalog 201.

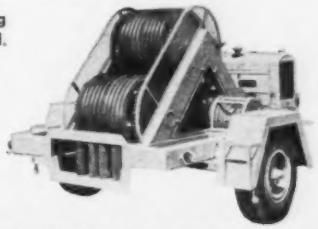
PENGO Job-Proved Tension-Stringing Equipment

Manufactured by the makers of the World Famous PENGO Earth Auger

NOTE: More than 40 models of PENGO Tension-Stringing equipment models are available for every stringing need.

PENGO Bullwheel Cable Pullers

MODEL 6100 TC-RW Reel Winder.

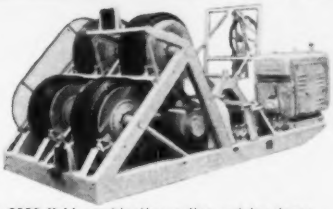


MODEL 5700-II, trailer mounted, pulls one or two conductors or pulling lines. Tensions to 4,000 lbs. Use with PENGO 6100 TC-RW Reel Winder.

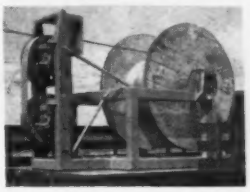
MODEL 6700-I, trailer mounted, pulls one conductor or pulling line. Tensions to 12,000 lbs. Use with PENGO 6100 TC-RW Reel Winder.

MODEL 6700-II, skid mounted, pulls one or two conductors or pulling lines. Tensions to 12,000 lbs. Use with the 6100 TC-RW Reel Winder.

PENGO Tensioners



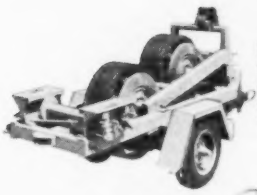
MODEL 6000 U-11 combination puller and tensioner. Handles one or two conductors to 1,272,000 CM.



MODEL 5000 S-I strings one conductor to 556,000 CM. Tensions to 2000 lbs., takes reels to 44" x 72".

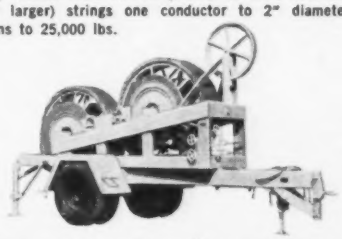
MODEL 5000 TR-II strings one or two conductors to 556,300 CM. Tensions to 1500 lbs. per conductor. Designed for very rough country work as well as general use; use with separate reel-carrying dolly or PENGO 6100 CT-RW.

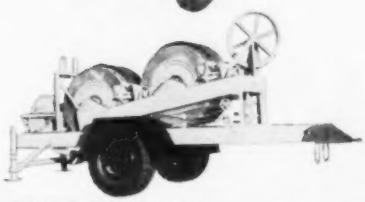
MODEL 6000 WS-TR strings one or two conductors to 1,272,000 CM. Tensions to 5000 lbs. per conductor. Complete trailer unit with reel-carrying devices, for general and medium-rough country use.



MODEL 6000 XHD-TR-I-A6 shown with snubbing brake. Strings one conductor to 1,272,000 CM. Tensions to 10,000 lbs.

(Below) **MODEL 7000 TR-I-72** (similar to 6000 XHD-TR-I, except larger) strings one conductor to 2" diameter. Tensions to 25,000 lbs.





MODEL 7000 TR-I-54-A7 strings one conductor to 2" diameter. Tensions to 25,000 lbs. Extra sturdy, with 54" Bullwheels for low center of gravity – ideal for mountainous terrain.

List your requirements and send for descriptive literature and prices.

PETERSEN ENGINEERING CO., INC.
Santa Clara, California

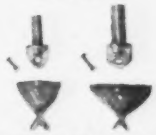
Other PENGO Products

Heavy Duty Double Helix Augers

Extra Heavy Duty Flight Augers (shown with gravel guards)

Offset Boring Heads

Heavy Duty Offset Boring Heads



Screw Bits for Small Holes

Pulling Eye

Screw Anchor Tool

Pole and Transformer chariot

PETERSEN ENGINEERING CO., INC.
Santa Clara, Calif.

Please send PENGO Tension-Stringing equipment data to:

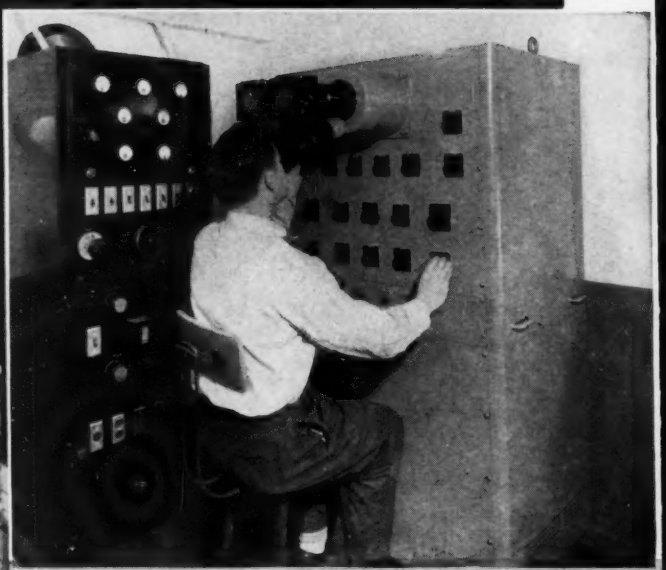
NAME:_____

FIRM:_____

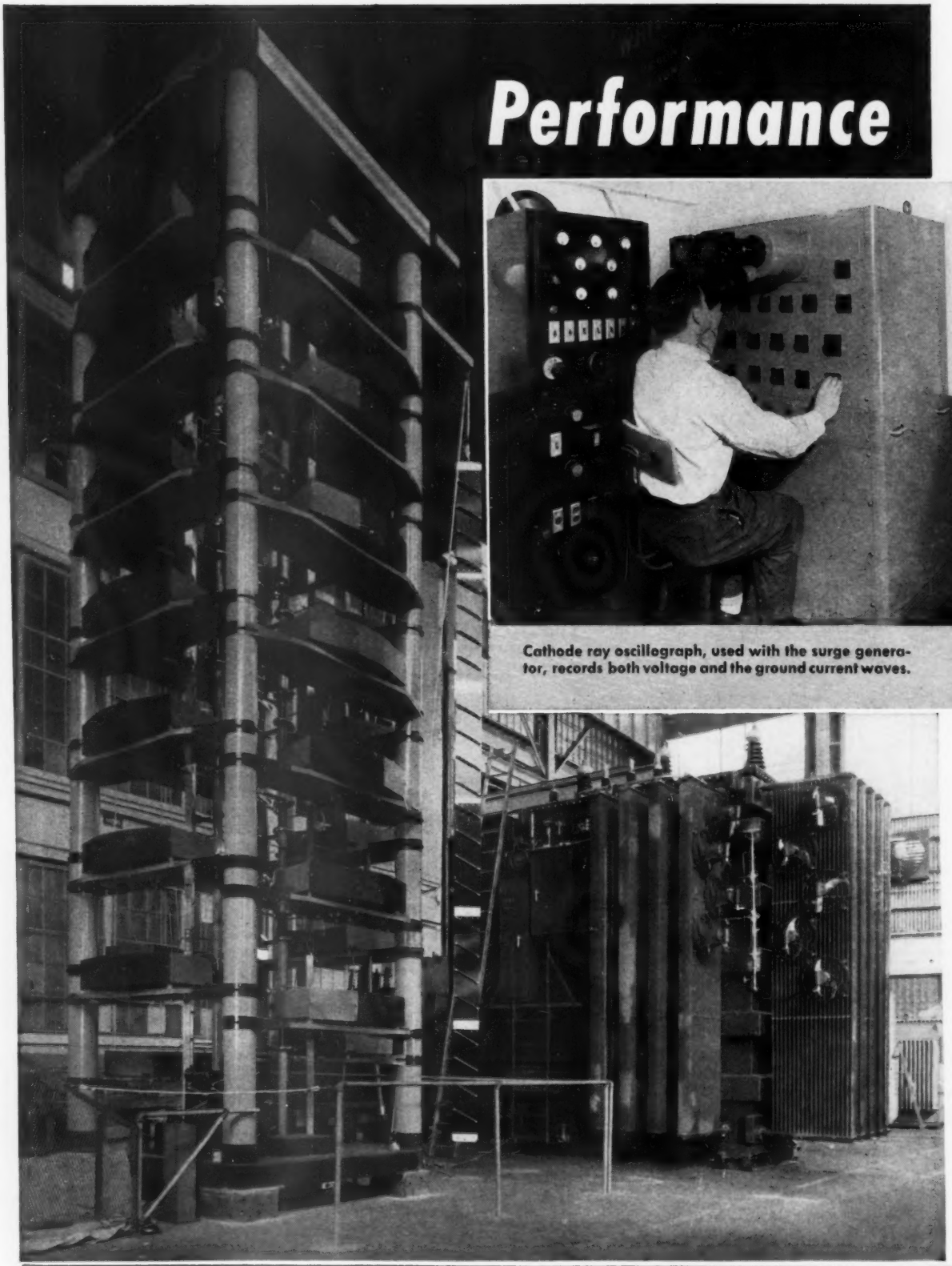
ADDRESS:_____

CITY_____ STATE_____

Performance



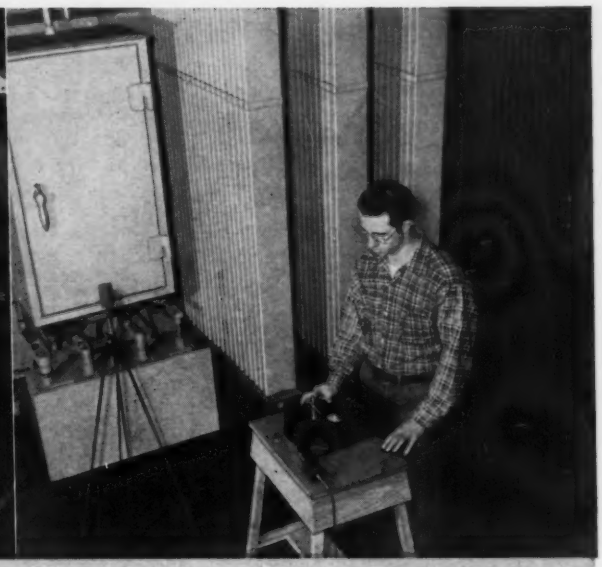
Cathode ray oscillograph, used with the surge generator, records both voltage and the ground current waves.



This surge generator is capable of producing up to 3 million volts at 25,000 amperes, and is used for impulse testing all voltage classes of transformers.

stability proved by tests...

Control panel for a 300 cycle generator used for induced voltage testing in accordance with the commercial standards of ASA and NEMA.



This large power transformer is being given an audible sound level test in accordance with NEMA test procedures.

Wagner Power Transformers are test-proved to give better service

The performance stability of Wagner Power Transformers is outstanding. That's because quality is designed and built into these transformers by specialists with years of transformer engineering and production experience.

These specialists insist on the use of only the highest quality materials — on carefully controlled production methods — and on constant inspections and tests to make doubly sure that their transformers will have the kind of performance stability that means better service on your system.

Ask your nearby Wagner Sales Engineer to show you the Wagner motion picture "Transformers in the Making" or, if you prefer, write for Bulletin TU-16D.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6381 Plymouth Ave., St. Louis 14, Mo., U.S.A.

WT58-1

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

ELECTRA'S HUSBAND

"Who's Important?"

WHO'S the most important man in the utility organization? That question finally came up as several of us were sitting around the patio on a Sunday afternoon conversing in that relaxed fashion that follows a backyard steak feast.

After running the gamut of nominees from the president to the station operator, the sales manager piped up: "I think the utility sales representative is probably the one person who packs more impact on company policy than anyone else."

"That's a thought, but you'll have to expound more before I buy it." This was from a dyed-in-the-wool engineer, who has a pretty realistic attitude toward everything. "After all, ask the average utility customer what a power company sells. He will certainly reply—electricity. This average customer might very likely add that—since he has to buy the company's electricity—very little selling is required."

"That would be easy," replied the sales manager, "if it were all that had to be done. However, an investor-owned utility today must sell much more than electricity. The company has to sell service, yes, but more than that, it has to sell itself. Basic to that job is the company's staff of salesmen, who is its main business contact with the public. Did you ever stop to think just what the utility sales representative's job consists of? He has to be quite a fellow."

"I guess most of us have a general idea what he's supposed to do, but from your remarks I gather there's a lot more to it than meets the eye."

"That there is, and I'll tell you about it," said the SM.

"First of all, he calls on the residential customers, selling greater use of electrical equipment and appliances, counteracting the sales effort of competition and preventing or eliminating customer dissatisfaction with the use of utility service.

"Then he arranges for, prepares and delivers complete sales presentations or planned explanations of the benefits and collateral advantages of utility service before assembled groups.

"What's more, he sells, takes contracts or orders for special appliances and equipment for the company, and secures prospects for appliances and equipment for cooperating dealers of the customer's choice. That's just the selling phase of his job."

"I guess there's no use trying to stop you now," sighed the engineer. "Let's have the rest of it."

"Well," went on the SM, "our boy also is a consulting engineer and sales trainer too. He assists residential customers in the planning of home lighting, modern kitchens, laundries, adequate home wiring, cooling and ventilating systems. He engineers residential heating and cooling designs and installations. He can and does prepare operating cost data for utility service and competitive fuels and works with industrials to see they get the most advantageous rates through power factor correction and other things.

"He works with dealers and allied trades in designing and securing tie-in advertising on specific promotions and helps the retailers follow through by aid in sales meetings. If he's really on his toes, he takes responsibility for securing and retaining memberships in trade associations and pushing industry programs."

"You're beginning to convince me," I commented. "This boy must be busier than the proverbial one-armed paper hanger."

"Oh, that's not half of it," the SM was smug now. "I'm just leading up to the really important part. In addition to all these things and a good many others, he is expected to bear a major part of the responsibility for implementing designated public relations programs. He is the fireman, on call 24 hours a day, ready to go wherever and whenever he is needed.

"A big part of his job is correcting customer misunderstandings of the company, its services and policies, and taking the necessary steps to correct them.

"In school programs, it is the salesman who makes the contact. In get-acquainted programs with granges, it is the salesman who makes the calls. He participates in the speakers' bureau, distributes literature, shows films, puts in window displays; in short, sets the sales pace."

"That's some job specification." It was the engineer speaking. "This paragon must possess all the qualities of an executive."

"He *is* an executive," defended the SM. "He must have an active interest in his job, an above-average level of intelligence, a high degree of social interest, leadership, the ability to plan, sufficient drive to make himself work and the ability to follow through. In other words, he has to be a self-starter."

"Okay, okay," we all chorused, "you've made a sale—as usual."

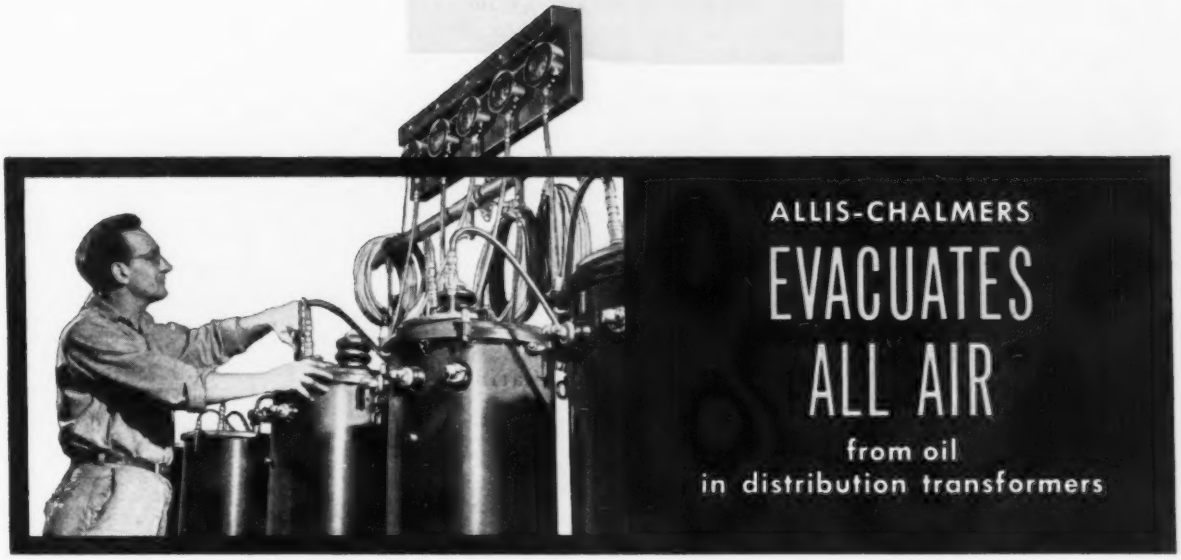
"Well, let me finish anyway," replied the SM. "All of us, in part, are industry sales representatives. It is important that, in addition to selling electrical equipment and service, we, too, must be prepared to sell the elcetrical industry.

"No industry has kept better faith with the people it serves. No industry has fulfilled its obligations in a more efficient and dynamic manner. The people must be made aware of the advantages they have derived from the investor-owned industry as a well regulated, taxpaying industry dedicated to public service.

Our company doesn't believe that the sales training job is done when the new commercial salesman is taught to make a layout for store lighting; or when he learns heat loss calculation, adequate wiring, kitchen planning, electric rates and the installation of water heaters. These things are just the sales foundation upon which we build business.

"Also into sales (and employee) training must go the stormy background of many political battles. All of us must always be in the front ranks of that determined group who believe that, unless we work effectively, it is only a matter of time until our free enterprise system is completely eliminated. In an industry that is the No. 1 target for social planners, the sales representative is a front-line soldier. But he needs lots of support and backing. That's your job."

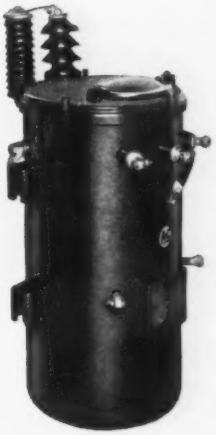
There's a good reason WHY...



Vacuum Process ADDS DIELECTRIC STRENGTH

EVERY Allis-Chalmers core and coil assembly, while it is still hot from the dry-out oven, is tanked and completely immersed in hot dry oil. Immediately afterward, a vacuum process draws out air bubbles trapped within the mechanical structure and oil. This process assures complete oil impregnation of all fibrous insulation before the transformer leaves the factory. Result: Maximum dielectric strength. Benefit: Extra years of dependable service and more economy in transformer operating costs.

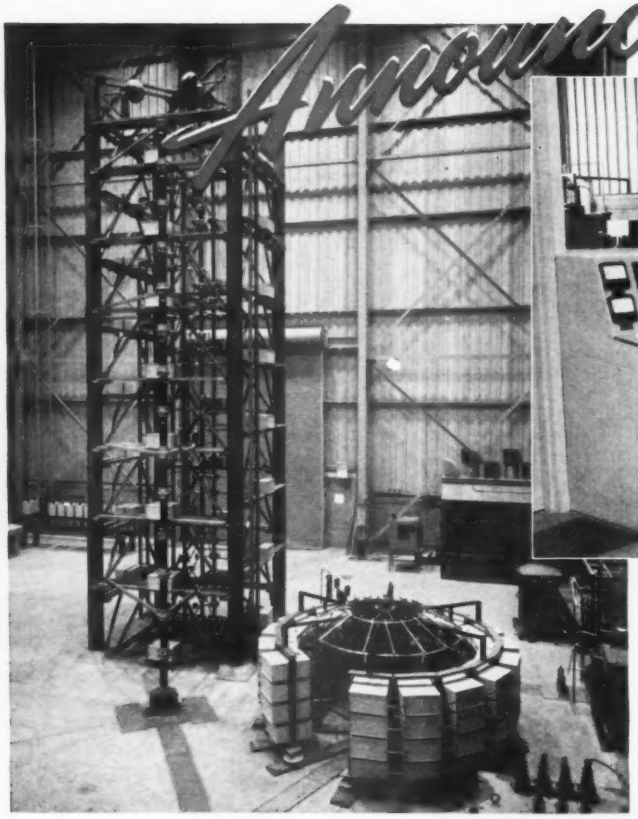
For *all the good reasons why* Allis-Chalmers distribution transformers deliver outstanding performance for many years, call your A-C man. Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



ALLIS-CHALMERS

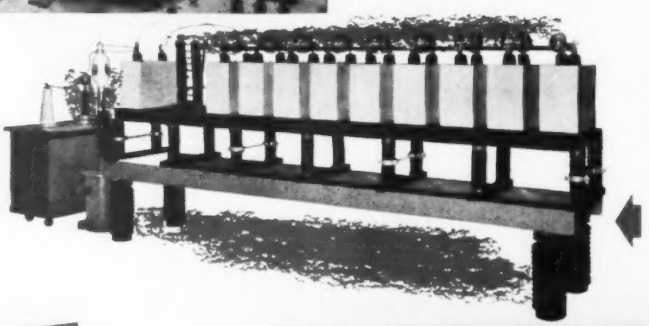
A-5723

Announcing ... NEW

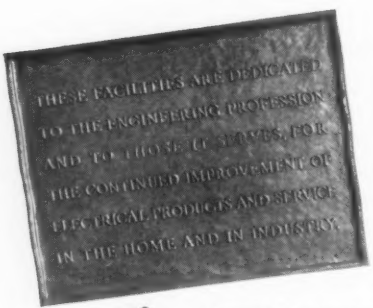


Here a 3,200,000 volt surge generator—powerful enough to spark over a 17 foot gap—simulates lightning effects on electrical equipment. High surge current generator is seen in the foreground.

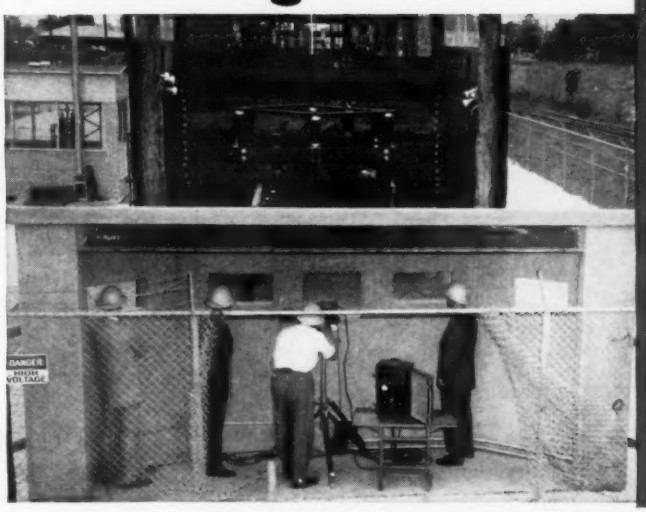
Nerve center of the laboratory—this master console permits control of all major equipment in both the outdoor and the indoor laboratory. Unique instrumentation includes interlocking controls, high speed recording devices for diverse, precise testing.



Of the five lightning generators included in the laboratory this 500 kv generator can be adjusted to produce a variety of waveshapes

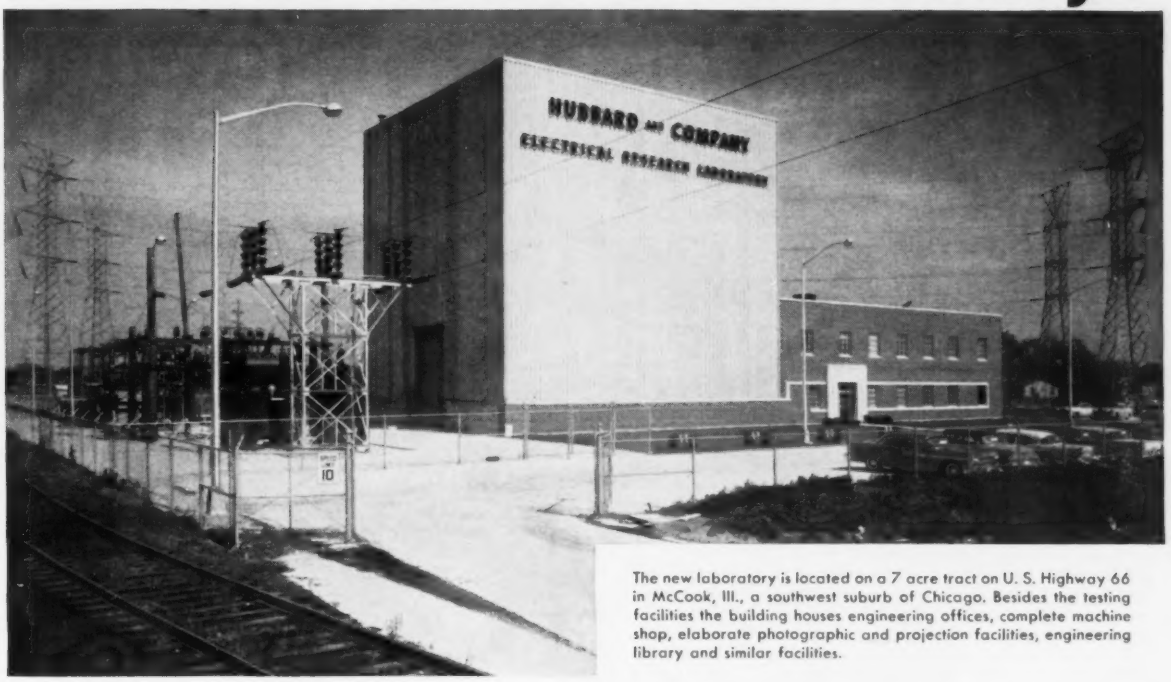

THESE FACILITIES ARE DEDICATED
TO THE ENGINEERING PROFESSION
AND TO THOSE IT SERVES, FOR
THE CONTINUED IMPROVEMENT OF
ELECTRICAL PRODUCTS AND SERVICE
IN THE HOME AND IN INDUSTRY

Bronze dedication plaque at entrance to laboratory.



Outdoor laboratory—for comprehensive electrical and mechanical tests on full scale, live operating systems

HUBBARD Research Laboratory



The new laboratory is located on a 7 acre tract on U. S. Highway 66 in McCook, Ill., a southwest suburb of Chicago. Besides the testing facilities the building houses engineering offices, complete machine shop, elaborate photographic and projection facilities, engineering library and similar facilities.

What is it worth to KNOW?

What is it worth to know just what is needed in electric distribution equipment...to know just how to make it so that it will stand up under ALL conditions...to know just what steps are necessary to make a particular piece of equipment do a better job than was ever done before?

A number of years ago we reached the decision that KNOWING would be worth *whatever it cost*...and out of this decision came the now completed Hubbard Electrical Research Laboratory. Its purpose is to give new wings to Hubbard product design and development...to do this by integrating all engineering research and testing facilities in one area...to make development, research and testing as it should be ...a creative guild unto itself!

Yes, the laboratory is new; but not the idea on which it was built. Those who know Hubbard equipment realize that the higher standards to which Hubbard equipment has been held across the years is a basic result of the greater emphasis we have always placed on the testing phase. No one has ever gone further into this phase than Hubbard and Company. But now we have gone *still further*.

We have literally brought the field into the plant!

In this research center we can truly duplicate the worst possible conditions under which utility equipment can be expected to function. In it we can determine what to make and how to make it. In it we hope to find the means of solving problems heretofore unsolvable.

A few of the facilities are briefly described here—more fully in a new brochure available for the asking. Those who have an interest in the work we are doing are cordially invited to make a personal inspection of the new laboratory.

HUBBARD AND COMPANY • CHICAGO 50, ILLINOIS
PITTSBURGH 1, PA. • OAKLAND 8, CALIF. • PLANO, TEXAS

HILL CRAFTSMANSHIP GUARANTEES DEPENDABILITY

DISTRIBUTION TRANSFORMERS THAT GIVE "PLUS" YEARS OF SERVICE ARE STANDARD PRODUCTION AT HILL. "Inside" experience (coil experience) of highly-trained transformer specialists is the reason why Hill transformers stay in service. Each coil is wound to exact specifications by skilled, patient craftsmen. Couple their work with Hill advanced engineering design...meticulous care in every manufacturing detail. The result is extra years of on-the-job dependability.

UTILITIES BENEFIT from the new, modern Hill manufacturing facility—the only all-Western manufacturer of a complete line of distribution transformers.

COMPLETE STANDARD RANGE. Distribution transformers—3 to 500 KVA—are in regular production. Power and distribution transformers—Oil Filled, Askarel and Dry Types—are available through 5000 KVA. Manufactured to NEMA-ASA standards, Hill transformers carry a five year guarantee.

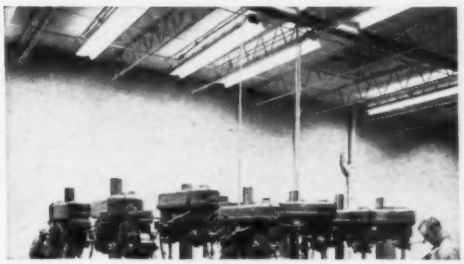
A copy of Hill's complete new distribution transformer catalog has been reserved for you. Request Catalog #2000

HILL

HILL TRANSFORMER CO., INC.
1030 WASHINGTON STREET
SAN CARLOS, CALIFORNIA

Whatever your customers want from higher output fluorescents...others are already getting...with G-E POWER GROOVES

THESE SATISFIED POWER GROOVE USERS EACH WANTED SOMETHING DIFFERENT . . . AND ARE GETTING IT!



SHAFER VALVE CO., MANSFIELD, OHIO

WHY POWER GROOVES? Because of improved color rendition and lower lamp replacement cost than mercury lamps.

JOHNSON-HILL'S DEPT. STORE, WISCONSIN RAPIDS, WIS.

WHY POWER GROOVES? To get more light (7½ times as much) from the same number of 40-watt lamps.

ERICKSON TOOL CO., CLEVELAND, OHIO

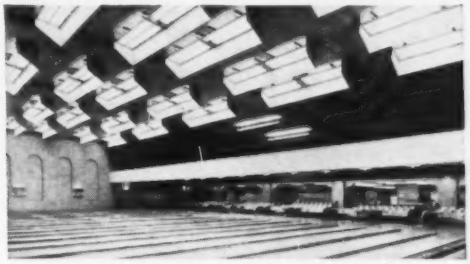
WHY POWER GROOVES? To get higher, more economical production lighting levels (160 footcandles), with no need for supplemental lighting.

GENERAL IRON & METAL CORP., CHICAGO, ILL.

WHY POWER GROOVES? To increase worker efficiency, speed-up production, reduce customer complaints.

CONVAIR, SAN DIEGO, CALIF.

WHY POWER GROOVES? To get the lowest operating cost compared to filament and mercury, and the highest level of light per watt.



PLA-MOR BOWLING ALLEYS, KANSAS CITY, MO.

WHY POWER GROOVES? To provide Pla-Mor lanes with a revolutionary, glare-free lighting system—superior to that in any other bowling center.

Don't *experiment* with your customers' lighting. Give them the newest fluorescent lighting that is endorsed by enthusiastic users all over the country. That *one*, of course, is the *tried-and-proved* General Electric Power Groove Lamp. Think of it! Almost twice the light of High Outputs—more than 2½ times the light output of slimlines! Power Groove users save up to 20% on initial cost, and keep maintenance at rock bottom at the same time. Call your local General Electric Large Lamp salesman right now and let him explain the whole Power Groove story to you. Or write: General Electric Co., Large Lamp Dept. C-839, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

editorial views

AIEE Pacific General Meeting

AT no time in the 75-year history of the AIEE has there been a greater profusion of ethical and professional questions confronting the directors of this — the country's largest — founders' society. The sputnik assault on engineering education, the splintering of IRE from the fold, the need for definition of the functions of the technical society and the purely professional society are examples of the kind of thought that is active.

The Sacramento AIEE meeting will bring together the board of directors, district vice-presidents and department heads of this society to discuss issues of importance to every member.

Here is a chance for the rank-and-file EE to rub elbows with these policy makers. Most of them will frankly admit that they don't know the answers to all of the problems now confronting the profession. There, in a spirit of informal fellowship, is an excellent opportunity to take part in the big decisions that are forthcoming in the engineering profession. This is an opportunity as well as an obligation for members of the electrical engineering profession.

Heat

THE problem of utilizing heat in all its many forms has never been more in the public eye than it is today. At one end of the spectrum are the solar energy proponents who are making no little progress in the direction of capturing sunlight for man's use. At the other end of the scale are the nuclear fission scientists who strive to reproduce solar phenomena, first in the test tube, then in the factory for man's pleasure, comfort and well-being. In between these two extremes scientific progress in heat application is being made on many fronts. Looming larger on the horizon every day is the thermal electric concept wherein heat applied to two different metals results in the production of electricity without inertia effect; and the reverse of this thermodynamic process wherein electricity applied to the junction of dissimilar metals produces cold. Already Westinghouse has prototype appliances using this principle.

From the more mundane standpoint, most of us will have to be content to get along with conventional sources of heat for some time to come. In this issue there are reported developments in the application of electricity to heating and cooling problems. One only has to read these and other articles to realize that electric heat still is in the pioneer stage and operating on the frontier of a rich and promising area of new applications in the home, on the farm and in commerce and industry. There are opportunities unlimited for electric heat applications in the service of mankind.

New Studies Needed

THE introduction of a self-regulating distribution transformer by Line Material Industries suggests some interesting areas for speculation about future system designs. Self-regulation is really the first fundamental change in design of distribution transformers since Stanley wound the first core and coils back in 1887. True, there have been refinements in the course of years but the basic elements remained essentially the same.

Second, it is interesting to note that voltage regulation in the course of all these years has moved progressively from the field rheostat on the first Edison generator successively through the substation (by means of regulators and later tap changers) out on the distribution circuit (through the use of pole top regulators and capacitors) and now, finally, is literally at the customer's doorstep. Each successive extension of the regulating function has shifted to a greater or lesser degree some of the

economic factors of system design. There is no reason to believe that the concept of the self-regulating distribution transformer should not also have a considerable effect on the over-all economic concept of system planning. Certainly there is a dollar and cents evaluation that can be placed on maintaining rated voltage at every weatherhead.

Relatively few people have ever given much thought to the idea that the highly efficient, reasonably modern distribution transformer might become subject to technical obsolescence. Only the most far-sighted engineers could have predicted just a few years ago that the industry would have a whole new family of devices devoted solely to the purpose of maintaining correct voltage and good power factor at the customer's premises. Now that the self-regulating transformer is available, system designers may have to go back over all their figures and re-evaluate and reintegrate all of the many complex factors that, in proper juxtaposition, produce the optimum system design. Maybe it's a good thing that computers can now help do this job.

Three Dollars a Barrel

THREE-dollar-a-barrel oil has become a significant figure in Western utility operations. The gradual evolution of Western utilities from hydro based systems to steam based systems, a trend which has been particularly pronounced in California, has pointed up the importance of fuel sources and fuel costs.

Pacific Gas and Electric Co.'s president, Norman R. Sutherland, in an address before the Nuclear Energy Colloquim at the California Institute of Technology set the economic ceiling on the use of oil as a fuel at approximately $3 per barrel. At this point oil runs into double-barreled competition. Studies leading to the announcement that PG and E would build an atomic station on Humboldt Bay indicated that nuclear fuels would be competitive with $3 oil in that area. Other PG and E studies concerning the long-range fuel requirements of the system indicate that Utah coal likewise becomes economically competitive with oil at the $3 figure. And even more interesting and significant was his statement that "looking ahead to the needs of our own area and assuming its demands for power will continue to increase as they have during the past decade, we believe that there should be one or more large nuclear plants in operation by 1965. What will happen thereafter will depend upon how rapidly nuclear plant costs are brought down and on the future prices of oil and gas. The odds indicate that nuclear plants should predominate in meeting requirements for energy."

FIRST of all, a word about our economy. Some weeks ago I made the statement that we were not yet out of the woods (recessionwise) but that I was optimistic.

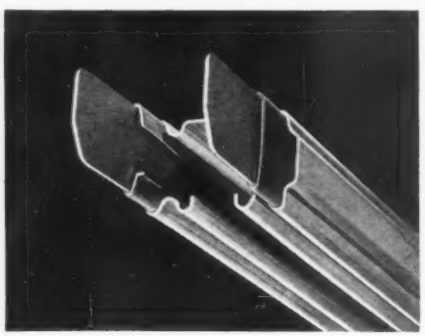
Generally speaking, the feeling is better. Businessmen with whom I talk are confident that business is going to be better and on the part of consumers there is increasing evidence that their confidence is in the process of being restored. This latter statement seems to me to be borne out by the fact that personal income is hanging right around the all-time August 1957 high. From this all-time high it has dropped about one-half of 1% against a drop in industrial production of 13%. This is considered by economists a most unusual phenomenon and reflects the overall stability of our economic system.—Statement by Secretary of Commerce Sinclair Weeks at news conference, July 10, 1958.

New Universal Lighting System—

for flexible, low-cost lighting

Specify efficiency and economy, too. BullDog's new 20-amp Universal Lighting System both feeds and supports lighting fixtures . . . requires no supplementary fusing. Fixtures can be positioned at any spot throughout the entire system . . . are quickly and easily moved to meet changes in lighting requirements. No rewiring or electrical downtime, either.

Listed by Underwriters' Laboratories, this new Universal Lighting System assures maximum flexibility at minimum cost. Check its many advantages. Consult your electrical distributor or BullDog field engineer. Or write BullDog Electric Products Co., Detroit 32, Michigan. © BEPCO



CROSS SECTION of new, low-cost 20-amp Universal Lighting System. Movable weight supports and twistout plugs speed rearrangement, addition or removal of fixtures, eliminate rewiring and electrical downtime.

HEAT BETTER ELECTRICALLY

BULLDOG

BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Detroit 32, Mich. *BullDog Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Rd., Toronto 15, Ont.

Consult the following Pacific Coast representatives:

Coast Electric & Manufacturing Co.
1733 N.E. Seventh Avenue, P.O. Box 7712
Portland 12, Oregon

Young Electric & Mfg. Co.
2134 Curtis St.
Denver 2, Colorado

Safety Switchboard Company
910—89th Avenue
Oakland 21, California

BullDog Elec. Prod. Co. of Los Angeles
2885 E. Washington Blvd.
Los Angeles 23, California

ELECTRICAL WEST

VOL. 121, NO. 2
AUGUST 1958

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

Welcome Alaska!

It's no longer the 11 Western States. The newest neighbor to the north brings into the Union (and the West) a great new frontier that adds 590,884 square miles of territory and makes the 12 states comprising the Western region total essentially half the area of the entire U. S.

Alaska is big geographically, being twice the size of Texas. Alaska is a storehouse of natural resources that undoubtedly will be drawn upon more freely under statehood. Alaska is endowed with a huge hydroelectric potential that equals about 18,000,000 kw, nearly one-third more than all the hydro capacity in the present 11 Western States. Pulp, fisheries, minerals, furs and power are the principal economic resources that the new state offers. The extent to which they have been exploited is negligible—as measured by the fact that the total population is barely over 200,000 people.

Climate

Climatically Alaska will never be a resort area, but it is attracting more and more of the confirmed nimrods, fishermen and tourists who revel in scenic grandeur. It probably will never achieve a high level of agricultural production because summers are short and warm and the long winter is severe by any standard, except in the extreme southeast. Vast areas in the north and west are tundra, suitable only for reindeer grazing. The heavy precipitation along the Pacific coastal area has produced a heavy forest cover, mostly of spruce and Western hemlock best suited for pulpwood rather than lumber.

In the mountainous region of the southeastern quarter of the state there are many fine hydro sites but as yet little market for power. Also available are large reserves of lignite and low grade bituminous coal, but total reserves are unknown as only 20% of Alaska has been explored and only 2% actually surveyed. Oil was discovered in commercial quantities only last year, but practically nothing is known about the size or extent of petroleum deposits. More than 30 basic minerals have been discovered with gold and copper now accounting for most of the mineral output and value.

Electric Power

At present Alaska is served by 11 investor-owned power companies, 12 municipal systems, seven REA cooperatives and two other organizations. The largest system, customer-wise, is the Chugach Electric Assn., with 10,584 meters serving the rural areas around Anchorage. That city is served by its own municipal electric department, with 8,854 customers. The largest privately owned system is the Alaska Electric Light & Power Co., serving 3,151 customers in the Juneau area. Probably the best publicized system is the Matanuska Electric Assn. Inc., which serves the New Deal experimental farm settlement in the Matanuska Valley. Ketchikan, Fairbanks, Nome and Sitka are served by municipal electric departments.

Alaskan power systems are not large by U. S. standards. Their total generating capacity is 91,350 kw, of which 19,100 kw is by diesel units, 44,850 kw by hydro and 27,400 by steam prime movers. The largest single plant is the 30,000-kw Eklutna hydro station of the USBR near Anchorage.

The new state already is in the forefront of atomic power. Two reactor projects are being concluded. The first is a sodium reactor for Chugach Electric Assn. of 10,000 ekw, and scheduled for completion in 1962. The second is a 1,700-kw "package" job for the Army at Ft. Greeley.

New Frontier

Removal of restrictions under its former territorial status will give impetus to the growth of Alaska as the newest and largest state. But it probably will build slowly because here is a frontier very similar to the West 50 years ago. Transportation and communication are limited. Little is known about the true resources of the area. Population is thin and conditions are likely to attract only the most adventuresome for some time. Seattle, the nearest metropolis, and economic gateway, to Alaska is 800 miles distant from even the southernmost part — and available only by water or air.

Raw Materials

On the other hand, as the West continues to grow in population and needs, Alaska's abundant raw materials may be expected to move closer and closer to the economical transportation contour and to competitive market prices. Abundant water power may be expected to attract petrochemical and mineral reduction industries. The country's insatiable hunger for cellulose products may speed the day when pulp production becomes a major Alaskan industry.

Its Western neighbors welcome Alaska into the closer associations that statehood brings. May the new state share bountifully in the growth, prosperity and importance predicted for the entire Western region.

Electrical West—Vol. 121, No. 2

A spokesman for the California Department of Education spells out the state's philosophy regarding . . .

The Thermal Factor in School Design

Charles D. Gibson*, Chief, Bureau of School Planning, State Department of Education, Sacramento, Calif.

There are five basic factors involved in the conditioning of space for educational purposes. These factors are spatial, thermal, visual, sonic and aesthetic. Although today we are interested only in the thermal factor, we must realize that upon the successful treatment of enclosed educational spaces in terms of all five factors depends not only the degree of safety and comfort provided for pupils and teachers but also in a substantial measure the educational usefulness of the plant and the efficiency and economy of its operation.

The design for achieving adequate and economical conditioning of educational spaces must be done by persons highly specialized in each of the several major fields involved. One of the crucial problems in good planning is to be aware of and to guard against the tendency of each specialist to overdo the solution in his particular field. Balancing the solutions among the specialized design fields becomes one of the most important responsibilities of the administrator, architect and educational planner.

Neglected Factor

It has often been pointed out in discussions of heating, ventilating, lighting and acoustically treating school buildings that it is "penny wise and pound foolish" to make a substantial investment in land structure and enclosure, and then attempt to save money by installing cheap and inadequate facilities to condition that space for the efficiency, comfort and delight of the occupants. The basic justification for providing both the enclosed space and its proper conditioning is the extent to which it provides maximum readiness for work and study and implements the school program.

The thermal factor in school design has not received the attention or understanding it deserves. Its real importance has been sidetracked in favor of more obvious factors, such as the spatial and visual factors. The truth of the matter is that in some ways it is more critical than any of the others.

The tolerances of the human body to thermal differences are extremely small. Either extreme of temperature causes discomfort quickly. In a schoolroom, discomfort means inattention, restlessness, poor behavior habits and a minimum of ability to maintain sustained attention to any mental task. Such discomfort means that 70% of the educational dollar is returning very little value to the community or state providing it.

No Organized Effort

The thermal factor in space design has not received the attention it should have in schools because there has been no organized effort to bring together the professionals who must be responsible for improving the thermal environment in schools. Our Bureau of School Planning tried to bring these professionals together several years ago, but members of the industries and engineering groups involved failed to sustain our original effort. So, here we are again today potshotting at a problem that requires organized analysis on a long-range basis.

The role of the educational planner in the solving of the thermal design problem is to express the educationally desirable specifications for a good thermal environment for schools, and then evaluate suggested solutions against those specifications. The educational planner also must serve as a screening medium to check schoolhousing plans for the balance they must have if true value is to be received for the dollars spent on school construction.

We are not nearly as interested in types of systems as we are in obtaining adequate results. Or, conversely, we are interested in *all* systems to the end that they can produce a good thermal environment.

Besides individual and personal factors are some general environmental factors which must be controlled if an adequate thermal environment is to be provided. These factors are: air temperature, radiant temperature, relative humidity, air motion, odors, dust, dirt and atmospheric contaminants.

Heating systems range in type from individual room stoves to automatic systems that maintain positive temperature control at all times. Ventilating systems vary from the open window to mechanical supply systems that maintain complete control of all air movement.

The choice of the type of heating, ventilating and/or air conditioning system installed in a school building depends upon a proper balancing of the following factors: the quality level of comfort desired for the occupants of the various spaces; the kinds of activities to be performed in various spaces; the size of a building or plant; building codes; maintenance services available; the competence and often preferences of the designer; operating and maintenance costs; and original cost. Each of the various systems has some advantages and disadvantages for particular installations and operations, varying with the climate of the region and other factors.

Thermal Requirements

The big job is to find the system best suited to each individual job. There has been a tendency on the part of architects and engineers to become married to one particular system and to apply it to every job no matter how such jobs may vary in design and location.

When thought is being given to the type of heating, ventilating and/or air conditioning system to use in a specific project, there are some general considerations we believe important. Any system used to create and maintain a good thermal environment in a schoolroom must be capable of quickly warming the building in the morning on time for occupancy; it must provide sufficient heating or cooling to maintain the thermal environment during the day under the widely varying conditions

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*Extracted from a talk before the Business Development Section Conference of the PCEA at Los Angeles March 6, 1958.

of solar and internal gains and outside temperatures and exposures; it must reduce the temperature at night when the building is unoccupied. The system should maintain even conditions in all parts of the schoolroom; it should take up as little classroom floor space or usable wall space as possible; it should be noiseless; and it should be equipped with automatic controls to eliminate the teacher as the controlling element.

It only seems fair to spend a little time discussing air conditioning and electric heating in schools. In reality, I have been doing just that. As planners, we are interested in setting up defensible criteria by which we may evaluate the relative merits of the many proposed solutions we encounter. I have given you those. The system or systems that meet these criteria best represent our first choice. When other factors—most of them money—make it necessary to do less than the best, then planners must settle for a solution that does not meet some or many of our criteria. I'll leave it to you to arrive at your own conclusions about how well **your** solution meets our objectives. I will, however, make some observations about air conditioning and electric heating.

The term air conditioning needs further clarified definition if we are to establish intelligent communication about it with the lay public. Now the term means everything from bringing some small amount of outside air into a room through a mechanical ventilator to refrigeration cooling. The difference between ventilation and air conditioning must be stated clearly and the difference pointed out.

Air conditioning certainly is here to stay. Its acceptance in such buildings as hotels, hospitals and office buildings has established its desirability beyond serious question. Although cooling systems are not yet common in school buildings, there are some which are completely air conditioned. Many more schools are being designed with heating and ventilating systems that lend themselves to the addition of complete air conditioning at a later date.

Electric heating is no stranger to school design. It was used in a minor way for heating in the southern, southwest and West Coast areas of the United States as early as the 1920s. It has not become a major heating system in schools for the following reasons: (1) prohibitive power rates for electricity; (2) inadequate power sources; (3) inefficient electrical heating units; (4) costly ventilation with electrical units; (5) inadequate control equipment; (6) local pressure to continue the use of such fuels as oil and gas; (7) reluctance of architects and engineers to consider electric heating units; (8) reluctance of school boards and school administrators to try something new.

The advantages claimed for electric heating are as follows: (1) cleaner environment; (2) more sensitive controls; (3) more efficient use of energy; (4) more flexibility; (5) lower first cost; (6) lower cost of custodial services.

No matter how the pro and con balance sheet works out for air conditioning and electric heating, the two big deterrents to their greater use in schools are: (1) inefficient equipment; and (2) cost. The most recent cost data on air conditioning schools that have come to my attention is the story by Henry Wright in the January 1958 issue of the *School Board Journal*. Frankly, his report isn't very encouraging to those of us who are trying to maintain a balanced physical environment in schools while staying within construction budgets that get tighter and tighter as the pressures for more classrooms pile up. A better case and better communications must be built up before these school design features will become common—as desirable as they may be.

"Educators, architects and engineers, working together, can get a better, more responsive and, in many instances, less costly physical environment for students and teachers. When each professional group learns to stay within its own area of competence and begins working at school plant design through a cooperative, problem-solving approach, then we will make real progress."

Background Facts About California Schools

Quoting from such authorities as Dr. Carl Frisen, senior research technician for population studies, California Department of Finance, and Dr. Roy Simpson, superintendent of public instruction, Department of Education, Dr. Gibson brought out these background points about the educational system:

- During the 1955-56 school year, California's public and private high schools graduated about 107,000. In 10 years, the number will be 220,000; in 15 years it will reach 280,000.
- By 1970 it is estimated that there will be 167 pupils in California public schools, elementary and high, for every 10 enrolled in the fall of 1956.
- Expenditures for new classrooms and the minimum replacement for unsatisfactory rooms, at today's building cost, will exceed $2.5 billion. The annual cost of operating the public schools, in terms of today's cost level, will approach $1.5 billion.
- State funds to meet schoolhousing problems are running dangerously low. The present legislature will be asked to supplement them by some thirty million dollars and the people of California will no doubt be asked next November to vote another state bond issue of sizable proportion.
- Cost of buildings and fixed equipment represents only from 8 to 12% of the annual cost of educating a child. In California last school year the average current expense cost of educating an elementary school child was approximately $280; that for a high school student about $420.
- A $600,000 elementary school will serve some 650 students per year for 40 years, which is less than $25 per year per student on physical plant.
- Of the total educational dollar, approximately 70% is spent on the instructional program. Its effectiveness depends upon how wisely the 8 to 12% for physical space is spent.

Electric heat can be sold . . .

. . . in any age home . . .

. . . to replace any kind of fuel.

Promotion will shift the buyer's preference . . .

. . . because electricity is cleaner, more convenient and costs little more.

Installation costs of electric heat are low . . .

For older homes . . .

WWP tells . . .

What We Learned

Harold U. Wright and Duane H. Olney

Washington Water Power Co.

For schools and commercial buildings . . .

In the first year of active sale of electric heating, Washington Water Power Co.'s sales record was:

	Residential	Commercial
No. sold	1,395	534
Average kw installed	11.8	8.4

This electric heat was installed:

29% in new homes
19% in homes under 10 yr
38% in homes under 20 yr
33% in homes over 20 yr

The big market is in modernization! The healthy new home figure is a barometer of the growth in customer acceptance.

Electric heat replaced other fuels in this proportion:

Oil	73%
Coal	14%
Wood	6%
Gas	3%
Other	4%

Over the years, surveys on heating preference have been conducted. Notice that while the majority still prefer oil, there is a trend to electric and gas heat. Surveys asked, "What type of heating do you prefer?"

	1957	1956
Oil	36%	21
Electric	**26%**	19.7
Gas	22%	?
Coal	12%	?
Other	4%	?

Asked **why** they prefer one form or another, users said:

	Electric	Gas	Oil	Coal
Clean	72	64	13	10
Convenient	31	14	23	....
Cost	28	37	25	48

People will pay to be modern. Coal, with a clear cost advantage, is on the bottom of the preference list!

Several contractors were asked for bids on heating installations for a group of project homes. The results:

Electric	**$542**
Gas	$680
Oil	$786

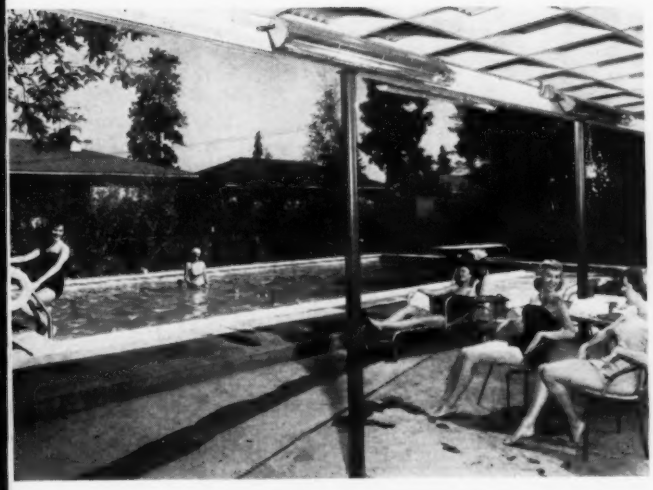
This would enable homeowners to defray the cost of insulation, or apply savings to future fuel bills.

Horseback estimates (of the 2 watts/ft^3 variety) may result in overinstalling equipment by 50%. ASHAE methods and those of some equipment manufacturers are not complicated—and far more accurate. Overinstalling can result in needless handicaps to utility and customer in cost to serve and cost to install.

. . . if realistic appraisal of heating requirements is made.

For new homes . . .

About Electric Heat



For patio and recreation areas . . .

Operating costs are more favorable than the heat equivalents would indicate.

A comparison of thermal equivalents and actual experience in the Spokane area shows the difference:

	Thermal Equivalent	Actual
Gas	100	100
Oil	108	127
Electric	**196**	**156**

Using the thermal equivalent estimate, annual cost would run 23c/ft²/yr. Actual figures average about 16.5c/ft²/yr, with some as low as 9.4c/ft²/yr.

For schools in the Spokane area, capital savings of $1/ft² are being realized. The principal and interest on this saving will go a long way toward paying added operating costs. Some typical operating costs are listed:

	c/ft²/yr
Home	16.5
Store	18.1
Office	18.3
Church	18.9
School	15.0

The capital saving is even more pronounced in some other commercial installations.

Electric heating is attractive for schools and commercial installations.

The main advantage to electric heating is the fact that this load will double or triple annual kilowatt-hour sales. Studies show:

	No Heating Group A	Heating Group B	Heating Group C
Kwh per customer	7,070	14,777	20,009

Residential electric heating is profitable for utilities to sell and serve.

In spite of the poor annual load factor . . .

Load factor	36.0	28.2	28.0

There are advantages and disadvantages . . .

and high average coincident demand at time of evening peak.

Kw average coincident demand—at evening peak	2.4	5.4	7.3

. . . that about cancel out . . .

the kwh sales per kw of evening demand are about the same . . .

Kwh/kw at evening peak	2,972	2,747	2,730

and kwh per kva of transformer capacity is better.

Kwh/kva of transformer capacity	4,808	4,898	5,121

. . . to the end that this added load is equal or better than an equal amount nonheat residential load.

This means that slightly poorer load factor is traded for much higher energy sales. What is lost in additional generation plant is probably offset by decreased distribution plant resulting from higher load density.

CUSTOMER: MR. AND MRS. JOSEPH E. AKERSON, 25489 Judith Ave., Arvin. Size of house: 1,500 sq.ft. of conditioned floor area. Occupation: Teacher. Size of family: 2 adults. Reaction to heat pump: "BEST DAMN OUTFIT I HAVE EVER SEEN."

EQUIPMENT: General Electric. Year purchased: 1956. Motor load: 3.75 hp. Strip heaters: 10.4 kw. Service calls in past 12 months: None. Thermostat settings: 78° F., winter; 78° F. summer. Other electrical equipment on same meter:

(a) Range
(b) Automatic washer
(c) Clothes dryer
(d) Freezer
(e) Television
(f) Refrigerator
(g) Lights and portable appliances

OPERATION:

Billing Month	Kwhrs	Bills	*Degree Days This Month	*Extreme Temperature This Month Maximum	Minimum
October 1956	782	$15.31	135	91° F.	34° F.
November "	768	15.15	347	85° F.	30° F.
December "	1,558	24.63	627	69° F.	25° F.
January 1957	2,044	30.46	692	63° F.	24° F.
February "	2,300	33.53	321	73° F.	25° F.
March "	1,130	19.49	308	80° F.	34° F.
April "	970	17.57	156	90° F.	42° F.
May "	626	13.44	64	92° F.	47° F.
June "	638	13.59	-	108° F.	52° F.
July "	1,098	19.11	-	103° F.	56° F.
August "	1,322	21.79	-	102° F.	51° F.
September "	1,228	20.67	-	102° F.	54° F.
Totals	14,464	$244.74	2,650		

1. The above monthly bills represent the total operating cost of all electrical equipment on the customer's residential meter.

2. We suggest the smallest monthly bill, which usually occurs in the spring or fall when the outside temperatures are the mildest, probably represents the operating cost of all the electrical equipment on the meter except the heat pump.

3. We further suggest the approximate monthly bills for the heat pump's operation may be estimated by subtracting the smallest month's bill from each of the others.

4. Following this suggested procedure, we estimate the monthly bills for operating the above customer's heat pump to be:

October 1956	$1.87	February 1957	$20.09	June 1957	$ .15
November "	1.71	March "	6.05	July "	5.67
December "	11.19	April "	4.13	August "	8.35
January 1957	17.02	May "	-	September "	7.23

Estimated annual cost of heat pump operation: $83.46

*From U.S. Weather Bureau records taken at Fresno, California. A normal heating season is 2,532 degree days.

- 1 -

Page 1 from PG and E's notebook of case histories. All 62 are summarized in the table below to get overage operating factors for heat pump installations in the area

Customer case histories in San Joaquin area show that costwise . . .

Heat Pumps

"BEST damn outfit I have ever seen." This is the reaction of one customer in a recent survey made by Pacific Gas and Electric Co.'s San Joaquin division to let the user answer the question, "What does it cost to operate a heat pump?"

Not all 62 customers interviewed spoke so emphatically but most of them were enthusiastic and the words, "satisfied," "happy," "well-pleased" appear generally. Only one qualified with "fairly well satisfied," although two or three experienced trouble during the first months of operation and one said his unit might be a size too small.

A few mentioned high electric bills or service calls but more remarked on the "reasonable" or "economical" operating cost. A summary of operating factors for the 62 homes is printed here.

Earlier Study

This study follows the division's earlier survey counteracting competitor claims that heat pumps are new, therefore unproved equipment. Early in 1957 it published a brochure showing that heat pumps had been used successfully in the area since 1948. To back up this claim, the brochure contained a partial list of user's names, make of equipment, year installed and approximate motor load. It also carried a chart indicating the amount of heat the user might expect per unit cost from various competitive fuels.

"We have often been asked, 'What does it cost to operate a heat pump?'" commented Ken Hampton, commercial manager for the San Joaquin division. "But since houses differ in size, design and construction, occupants are comfortable at different temperatures and heating and cooling requirements differ from year to year, we could only estimate 'an average,' based on a relatively few installations."

For these reasons and to refute claims by the butane industry that heat pump operating costs are "exorbitant," the company set out to prove what it already knew, that Btu for Btu delivered to the con-

Average Operating Figures for Heat Pump
(based on 62 residential case histories)

	Units	Dollars 12 months
Size of unit *	5.16 hp	
Operating cost **		$151.94
Cost per hp connected **		29.45
Number of service calls †	1.90 per year	
Size of family	2.32 adults 1.41 children	
Size of house	2,080 sq ft	
Cost per 100 sq ft **		7.30
Hp connected per 100 sq ft	0.25 hp	

* plus strip heaters
** including strip heaters
† including routine filter changes

Can Compete

ditioned space, the heat pump's operating cost is less than any competitive fuel normally available in rural areas and that customers using them are satisfied. As Hampton put it, "What better way to 'use the user' in promoting heat pump sales than to lay their case histories before potential buyers and let them judge for themselves whether or not the comfort of heating and cooling is worth what it costs."

12 Questions

A 12-question survey form was used by division sales people making the survey under direction of George Zelhart, special representative in the department. Only customers having at least 12 months' experience with heat pump installations were interviewed.

Monthly kwh use and bills were taken from PG and E records, with permission of the customers. For purposes of the survey, everyone over 15 years old was considered an adult. Occupations and temperatures maintained summer and winter were recorded.

Degree-day figures were from the U. S. Weather Bureau records taken at Fresno. A normal heating season is 2,532 degree days.

Cost Breakdown

U. S. Weather Bureau records at Fresno indicate that there are approximately 30-day periods in the spring and fall when temperatures are such that little or no heating or cooling is required to maintain a comfortable indoor temperature.

Therefore, in summarizing its findings, PG and E took the total operating cost of electrical equipment on the residential meter; let the smallest monthly bill represent the operating cost of all electrical equipment on the meter except the heat pump; subtracted it from each of the other months to get the approximate figure for heat pump operation.

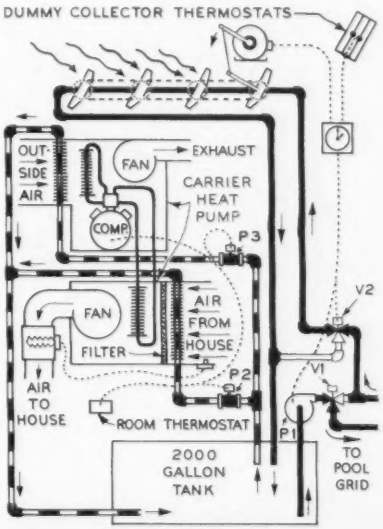
Temperatures used were for calendar months. Billing months might or might not follow calendar months because of meter reading procedures.

Model of the Phoenix Solar House. The heat-collecting louvers are clearly seen

Sun House Uses Heat Pump

EVEN the much talked about solar house—deriving its heat from the sun—operates electrically and can be classified as a form of electric heating via the heat pump. And so, while it takes free heat from the sun and thus has a relatively low basic fuel cost, the operating cost of the system, its pumps, collector panels, controls, etc., in the experimental pilot house in Phoenix will run about $550 a year. Moreover, being both a winter heating and a summer cooling job, the load factor electrically is excellent.

The diagram shows the scheme of the heat pump and solar energy collecting system. In operation the louver-collectors are turned to the sun in the morning and throughout the day by astronomical clock control. (In summer heat, these panels act as shade louvers to keep direct sun from the house interior.) These louver-collectors absorb sun heat and transfer it to water circulated in copper tubing within the louvers. This water is either stored in a 2,000-gal storage tank or in the swimming pool. The heat is withdrawn from these storages by the heat pump, which delivers warmed air to the house interior as demanded by the thermostats.



Schematic diagram of the heat pump and the solar energy collection system used

In summer the cycle is reversed and the refrigerant is cooled by the water from the pool where the heat is transferred. Sprays over the pool give added cooling if it is required. At nightfall the faces of the louver-collectors are turned toward the ground automatically.

The system as installed in the Solar House in Phoenix, designed by John I. Yellott as a project of the Association for Applied Solar Energy, cost about $4,000 more to install than a conventional heating and cooling system. This is expected to be amortized in about 10 years from fuel savings. Arizona Public Service Co. is cooperating in the metering of the pilot installation. Naturally it is equipped with more than the normal amount of metering equipment to record the operating characteristics of the system. Standard equipment was used for the system, such as is readily available on the market. The electrical installation was made by Associated Merritt Electric Co. for the National Electrical Contractors Assn.

In addition to the solar heating system the house is all-electric in its lighting, kitchen and laundry equipment and is wired for full Housepower. There was also installed a very complete sound and telephone system.

Electrical West—Vol. 121, No. 2

Nine-year study answers the question

What About Office Building Heat?

Paul H. Henrichs
Area Power Engineer
Southern California Edison Co.
Inglewood, Calif.

A nine-year study of space heating costs refutes the lingering belief that electric heating is expensive. The study compares cost data of heating the general office building of Southern California Edison Co. with 35 other Los Angeles, Calif., business buildings of comparable size.

The conclusion offered is that factors such as initial investment, interest on investment, fuel or energy costs and the very important factor of maintenance—all these factors throw the balance of economic efficiency in favor of electric heating.

When the Edison building was constructed in 1931, company engineers were convinced that this would be a golden opportunity to prove that electric power could be used economically for heating. To back up this conviction, they decided to provide submeters on the units to have an accurate record of electric heating costs.

The installation is two separate systems. One system is direct radiation-convection with heaters located under the windows in the rooms. The other is the installation of heaters in the supply air ducts. The direct system consists of about 700 wall heaters for a total of 1,300 kw, each controlled by a thermostat. The indirect system consists of about 350 kw of ribbon-type units and is controlled by the regular hot air heating system temperature controls. The direct system originally consisted of four different makes, Hotpoint, Hoffman, Majestic and Wesix.

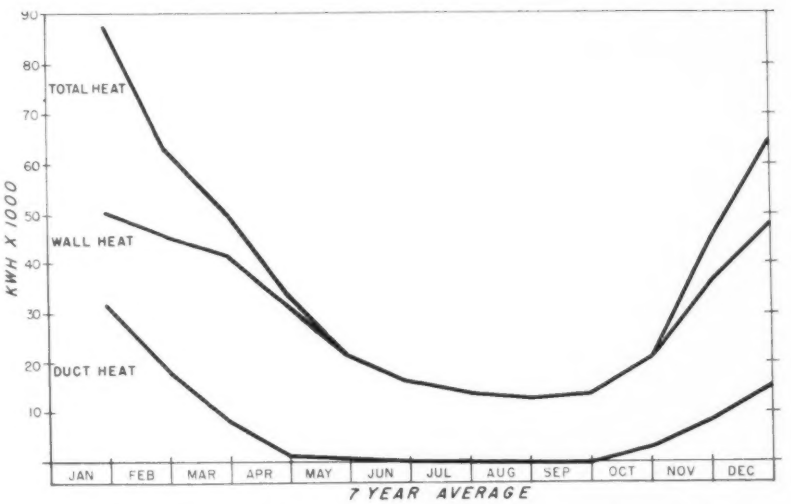


Fig. 2—Curve of average monthly kwh use shows heat is used every month of the year

Cost to Heat Edison Building With Electric Heat Compared With Other Buildings of the Same Category Using Other Fuels

Net leasable area ..... 160,000 sq ft
Gross conditioned area ..... 265,000 sq ft

Cost to heat (cents per square foot of rentable area)

	1948	1949	1950	1951	1952	1953	1954	1955	1956	Nine-Year Average
*Los Angeles average (About 35 buildings)	4.6	6.1	4.8	4.3	4.0	4.8	4.5	4.8	5.6	**4.8**
Edison average cost (0.86¢/kwh)	2.3	3.4	3.0	2.6	3.1	2.5	2.4	3.0	4.0	**2.9**
Estimate of Edison cost at higher kwh cost										
1.0¢/kwh	2.7	4.0	3.5	3.0	3.6	2.9	2.8	3.5	4.7	**3.4**
1.5¢/kwh	4.0	5.9	5.2	4.5	5.4	4.4	4.2	5.2	7.0	**5.1**

These costs are total heating costs including fuel costs, maintenance, operation, etc.

*Office Building Experience Exchange Report prepared by Accounting and Exchange Committee, National Association of Building Owners and Managers

Fig. 1—Edison building heat costs compared with average for other Los Angeles buildings

The results have been more than gratifying from a cost and comfort standpoint. Fig. 1 shows a comparison between the cost for heating the Edison building with electric heat and the Los Angeles average for heating 35 buildings of the same classification. The Edison company purchases power from the Los Angeles Department of Water & Power on a standard commercial rate. This shows that for a nine-year period, the Edison company average cost for heat was 2.9¢ per sq ft of leasable area. The Los Angeles average for this period was 4.8¢. In 1956 most of the fan-type heaters, which had been in service since 1931, were converted to radiant convection heaters. This accounts for the higher cost of heat for that year. By projecting our cost up to 1¢ or 1.5¢ it is found that electric heat is still economical.

Fig. 2 is an average monthly kwh consumption curve, which shows the heat is used every month in the year. It is interesting to note that there is a lot of heating used even during the months of July, August and September.

When all factors are considered, it will be found that electric heating is not expensive and, in most cases, is the most economical method of heating.

With electric heating on the increase it's . . .

$1,000—Yours or the Plumber's?

Effect of Electric Heating on Contractor's Profits

	Ordinary Wiring	All-Electric Wiring	Times Increase
Total contract	$438.00	$1,450	3.3
Gross profit	54.50	269	4.9

Extra profit! This is the reason that electrical contractors are taking a new look at the promotion of electric heat. The breakdown shows the results of a contractor's wiring two identical houses—one with conventional wiring, the other all electric. The all-electric home shows three times the dollar volume and five times the profit of the conventional wiring job.

I—Electric Heating is Key

The all-electric home came about when the decision was made to go to electric heating. That's the decision that moves the $1,000 from the plumbing contract to the electrical contract—and it's happening every day. Here are trends that are bringing about this change:

• Complicated calculations used to be part and parcel of every residential electric heating job. Detailed calculations were required or, worse yet, reliance on rule-of-thumb installations that always were too costly or inadequate.

Today, accurate recommendations can be prepared for the average home in half an hour, using manufacturer's design forms.

• The choice of units has been simplified in recent years, with a majority of installations going to baseboard in the "show" areas and wall units in the rest of the home.

II—Chance to Sell Up

• End result of accurate design is that electric heating usually costs less to install. So the contractor who sells the idea of electric heating gets the water heater, space heating and money to spare. What a chance to sell good garage wiring for shop use, patio and garden lighting, other flood, spot and safety lighting needs.

• Developers and homeowners alike want to get all of the bonus features a given figure will afford.

III—Obstacles?

• Utility attitudes have changed appreciably in most of the West. Utilities, even combination service utilities, are more open-minded to the all-electric home idea. In many areas, the outlook is one of enthusiasm and aggressive sales effort.

This shift in utility thinking becomes apparent to the contractor as an absence of the "Holy-smoke-nobody-uses-electric-heating-because-it's-so-expensive" attitude that has previously spiked any contractor sales effort.

• Electric heat costs more, in general, than competing heat sources. But people are willing to pay more for the fuel for today's super-powered cars—and they will pay the extra money for housepower, if it's sold to them.

IV—The Secret is Selling

• Today's situation is one of unusual potential. The design problem is no more. Simple, accurate design schemes remove the detail burden, placing contractors in a position to "take over" space heating and water heating from the plumbing and heating contractors. Utilities are cooperative, and people are of a mind to live better electrically—but someone has to ask for the order.

• The contractor who will ask for the order can figure his potential at $1,000 times the number of new homes in his area, plus the electrical portion of the $450,000,000 Western remodeling market. That's about 10% if you sell electric heating, and slim pickings if you don't.

• NEMA predictions show a growth in the use of electric heat *relative* to the industry as a whole. The time is right. It's clearly a case of $1,000—yours for the asking, or the plumber's by default.

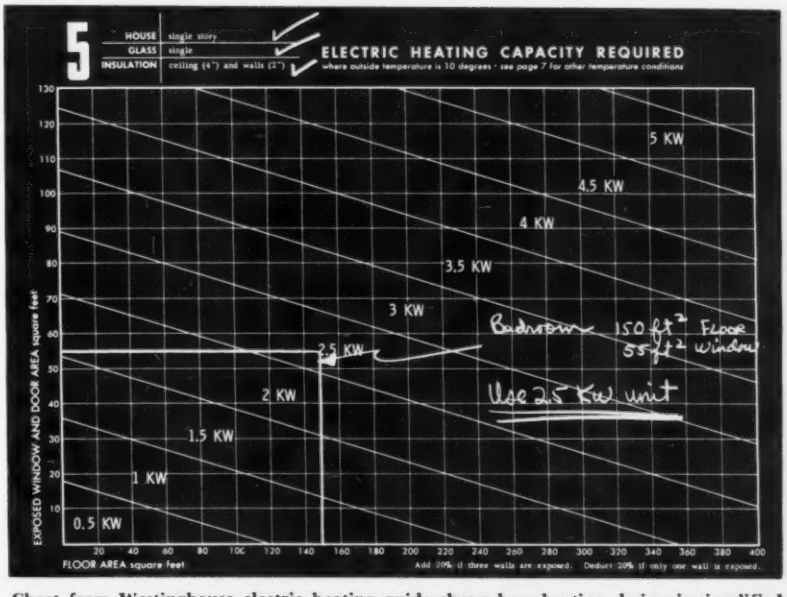
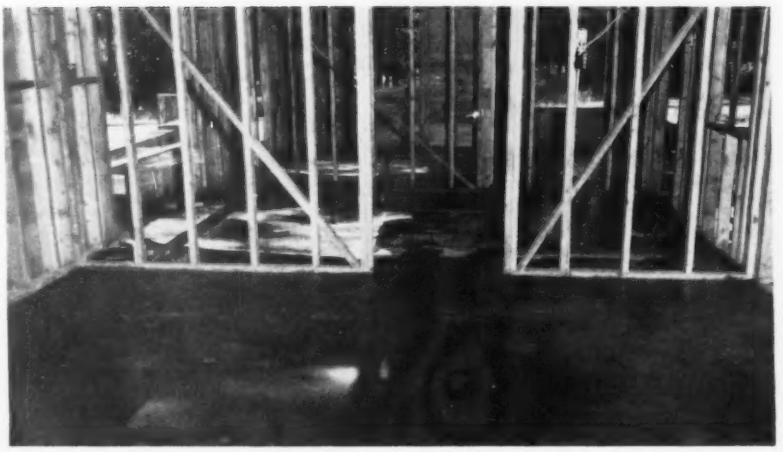

5
HOUSE single story
GLASS single
INSULATION ceiling (4") and walls (2")
ELECTRIC HEATING CAPACITY REQUIRED
where outside temperature is 10 degrees · see page 7 for other temperature conditions
5 KW
4.5 KW
4 KW
3.5 KW
3 KW
2.5 KW
2 KW
1.5 KW
1 KW
0.5 KW
Bedroom 150 ft² Floor 55 ft² window
Use 2.5 Kw unit
EXPOSED WINDOW AND DOOR AREA square feet
FLOOR AREA square feet
Add 20% if three walls are exposed. Deduct 20% if only one wall is exposed.

Chart from Westinghouse electric heating guide shows how heating design is simplified

Heating Cable Held Down

At left, electrician bends and tucks the ends of the cable under the fresh pour of concrete for the floor finish coat

When the architect required that the heating cable in the floor of a large house be held in place with a material that would bond itself to the top coat of cement it posed a problem for D. G. Quinton, Spokane, the electrical contractor, and Vern Ritter, engineer for Inland Electric Co., the distributor, who had designed the heating layout. It was solved by using a soupy grout of cement and sand laid across the rows of heating cable stretched across the slab and held there temporarily by a board frame. When the grout had set, the board frame was removed and the top coat poured. The curled ends were tucked under the finish coat.



Finished floor in place (above). At left is shown how the heating wires are grouted to the bottom slab. The board strip to which the wire was stretched has been removed and the ends curl up a bit. At center, the leads to the thermostat

This job is an example of teamwork between electrical contractor and the heating sales engineer of the distributor. This combined effort by electrical contractors and distributors in the Inland Empire (Spokane) area has brought about an acceptance on the part of the public for electricity as a preferred means of house heating. While this installation shows a cast-in method of heating, similar engineering and sales cooperation is employed in the sale of built-in wall space heaters, baseboard heaters, warm air furnace types and heat pumps. In this particular house the architect was sold on electric heating but he had specified so much that there was not room in the floor for the cable. Ritter and Quinton, because of their study of electric heating design, were able to re-engineer the plans to provide a fully adequate installation with considerably less cable and less cost as well. The customer was the chief beneficiary.

Architects, contractors, estimators, electricians and utility people attended six-hour course

Design and sales training combined in commercial-industrial . . .

Space Heating Course

Robert G. Scott
Commercial Sales Representative
Sacramento Municipal Utility District

To cover a neglected area with unlimited sales and load potential, the Sacramento Municipal Utility District in cooperation with electrical manufacturers recently conducted an electric space heat clinic dealing only with commercial-industrial applications and equipment.

The four-part, after-hours course combined the design know-how of space-heat sales engineers with that of a sales-training instructor. It was presented to 86 architects, contractors, estimators, electricians and utility personnel for a registration fee of $3 each.

The clinic consisted of three two-hour sessions and a final dinner meeting conducted by participating manufacturers. The first hour of each class was devoted to design principles and was handled by manufacturers' sales engineers. The second hour was devoted to selling techniques as applied to the commercial-industrial customer and was given by a sales instructor from the Dale Carnegie Institute. At the final dinner meeting, manufacturers' representatives were allotted equal time to talk about their particular company's space heat equipment.

The program was purposely held during the late spring—after the heating season and just prior to the time heating decisions are made for commercial or industrial establishments being remodeled or having new construction started.

Subjects covered in the "design principles" section of the clinic included windows, doors, ceilings, infiltration losses, allowances for lighting and people, types of building construction and loss allowances for extra ceiling heights. Also covered were air distribution, radiation vs convection, thermostats (how many, location and controls) and how to figure the size of the ducts from cfm and Btu requirements. In order to figure operating costs, detailed instructions were given concerning SMUD's commercial and industrial rates, how to read customers' bills and how to estimate kwh use.

In the sales portion of the clinic, basic sales strategy designed especially for commercial-industrial customers was explained, including the handling of objections and capitalizing on them. This part of the program also included the size and extent of the electric space-heat market for commercial-industrial customers and the development of business from satisfied customer follow-up calls.

This first venture of SMUD's into the almost unexplored area of commercial-industrial electric space heating proved so successful that the district and electrical manufacturers are planning a more extended course of this type next year.

Jack Gray (left), president of Gray Electric Co., accepts certificate at final dinner meeting from Clinic Chairman Bob Scott

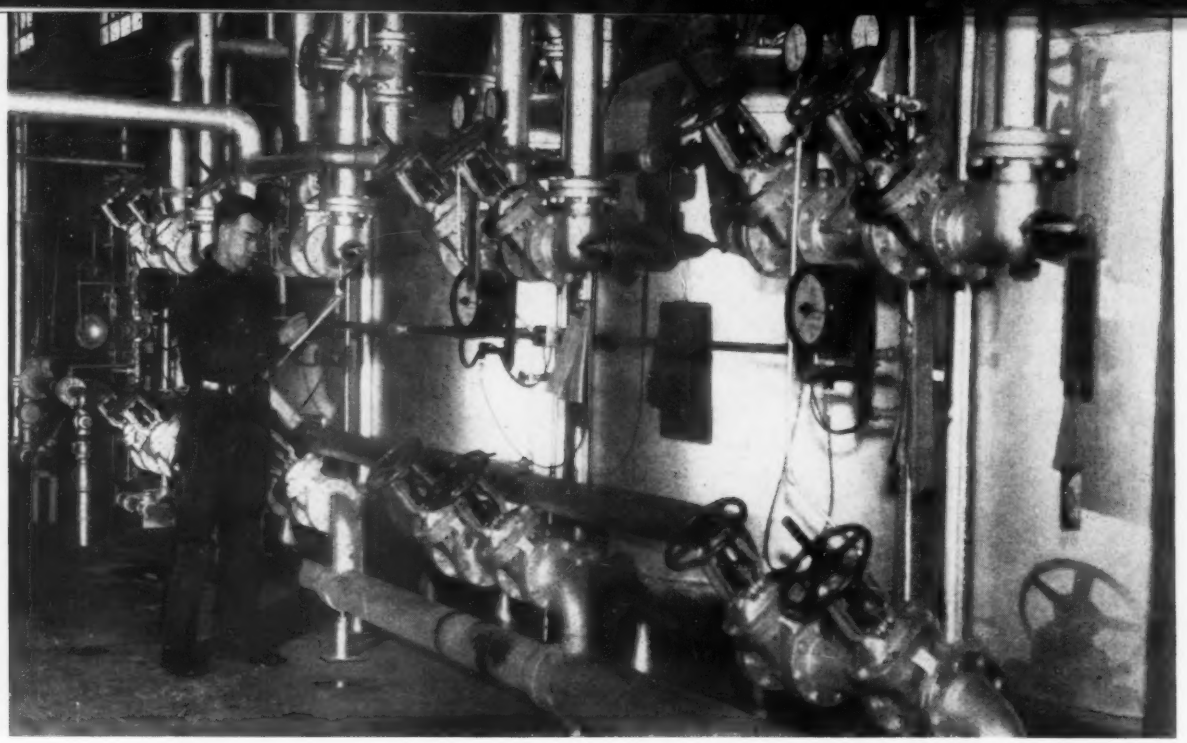
Drive to Spur Heat Pump Sales

Year-round air-conditioned comfort through use of the modern electric heat pump was the theme of a meeting to spark an all-industry campaign throughout southern California sponsored by the Los Angeles Department of Water & Power and Southern California Edison Co. at the Rodger Young Auditorium.

Approximately 400 attended the session, held in conjunction with the regular monthly meeting of the Institute of Heating and Air Conditioning Industries, to hear B. M. Osborne, heat pump expert and consulting engineer for Southern California Edison, stress marketing possibilities.

Explaining that southern California was trailing other sections of the country in heat pump sales, Osborne stated that 40% of the potential market of the nation is located between Sacramento and San Diego because no extremes in heat or cold prevail, making the climate ideal for heat pump operation.

In pointing out the expanding acceptance of the heat pump in modern homes, Osborne said that the combined heating and cooling system is cheaper to install, cheaper to operate and cheaper to service and maintain than separate units to do the same job. The fact that year-round air conditioning is now available at extremely competitive prices was also pointed out.



Public Service Co. of Colorado finds . . .

Hot Zeolite Softener Pays Off

Alan A. Woodward and William H. Bahret Jr.
Superintendent of Production Chief Betterment Engineer
Public Service Co. of Colorado

Drastic reduction in the cost of make-up water treatment for the boiler plant of the Zuni station has been made by Public Service Co. of Colorado engineers by the addition of hot zeolite equipment to an existing water softener. Improved internal cleanliness, less blowdown and better quality of steam are additional benefits.

Public Service Co.'s Zuni station is designed to bleed first or ninth stage steam (in addition to that for normal regenerative feed-water heating) to supply the downtown steam heating system. The line is sized to deliver 300,000 lb of steam per hour. Since all of the condensed steam in the heating system is rejected to the sewer, there is a sizable boiler feedwater make-up requirement at the plant.

Steam for the turbine is supplied by two boilers. One is a 350,000 lb/hr modern three-drum Stirling-type steam generator, and the other a 150,000 lb/hr integral furnace boiler. The arrangement permits the larger boiler to receive condensate, while nearly all the make-up water required by the steam is fed to the smaller boiler. This allows all make-up to a maximum of 150,000 lb/hr to enter the system in the form of steam, and causes deposits to precipitate in the smaller boiler. Since a unit of this design can be cleaned with relative ease, internal boiler deposits pose an annoying problem, but not a serious one.

To treat the city water make-up for the boiler feed system, the original installation was a hot lime-soda-phosphate two-stage softener with provision for sludge recirculation. The second stage effluent was passed through pressure filters containing "Anthrafil." This system was used for several years with fair results but, because of wide variations in city water hardness (depending on the source of the water), the output from the softener was difficult to control. This necessitated a semi-annual boiler cleaning program and a marked increase in boiler blowdown (as high as 28,000 lb/hr from the make-up boiler only) to hold reasonable boiler water concentration. Steam heat load fluctuations from hour to hour also contributed to the difficulties of softener operation, as did the 10-1 ratio of winter to summer demand.

These difficulties led to the installation of hot zeolite equipment to be used in conjunction with the existing softener. At the time these studies were made, experience with demineralizers of the size required was practically nonexistent and consequently were not considered.

The table shows typical raw water analysis with the results after treatment by the original softening equipment and finally, in Column 4, the expected performance of the hot zeolite softener. These results justified the installation of the zeolite process.

During the summer of 1955 the

original two-stage hot lime-soda-phosphate softener was changed to a single-stage system with its filtered effluent piped to a new hot zeolite softener.

The second stage of the original softener is now used as storage and backwash tank, and the filters were retained in the flow path to prevent the sludging of the zeolite resin.

Briefly, the hot zeolite softener consists of four tanks containing high capacity resin (HCR). The maximum operating flow per tank is 116,500 lb/hr and the softener capacity per tank is 285,000 gal of water having 84 ppm hardness. Regeneration of the resin is by sodium chloride. Conventional manually operated valves are used for the manipulation of flows through the softener tanks and fluid meters measure the amount of water passed through the individual softeners.

Actual Results

The beneficial results itemized below were phenomenal and far above the expectations.

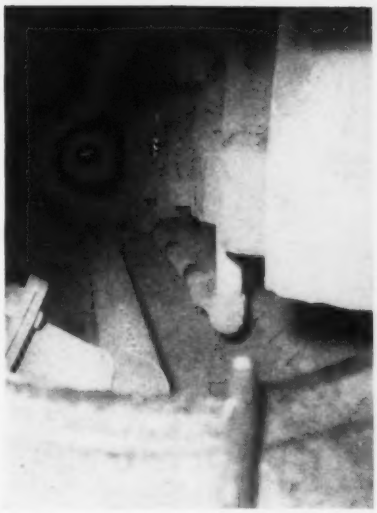
1. Greatly reduced water treating costs have resulted from the hot zeolite installation. This comes from the substitution of low-cost salt for high-priced di-sodium phosphate. Another increment of saving is realized by the reduction in the amount of sodium aluminate used as a coagulant. These monetary savings are shown in the accompanying graph expressed in cents/kilograin of hardness. With the present steam heat load, the annual saving in chemical costs alone is of the order of $4,300 on an investment of $39,000. Including the other benefits listed above, the total savings show a 13% monetary return, plus an improvement in the reliability of the make-up boiler.

2. Sludge deposition in the make-up boiler was almost completely stopped! Whereas in previous years two cleanings per year were absolutely necessary (see before and after photos), only one is now required.

3. Boiler blowdown has been greatly reduced.

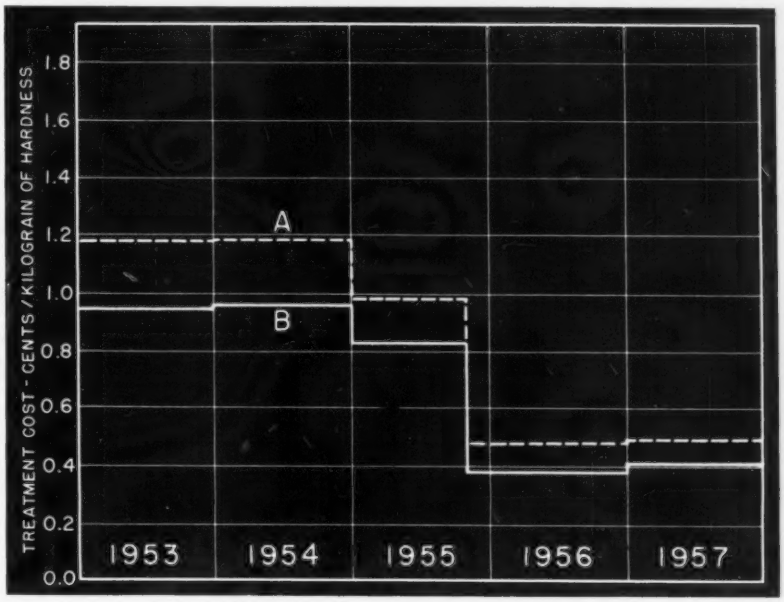
4. The high-pressure stage heaters of the regenerative cycle are found to be much cleaner than in the past and terminal differences stay more nearly normal, resulting in improved cycle efficiency.

5. Cleaner steam is being supplied to the distribution system—a benefit not anticipated. This has resulted in less fouling of strainers, traps, and reducing valve stems on customers' premises.



Before Looking into the boiler drum after 4½ months' operation before installation of the hot zeolite system

After Looking into the same boiler drum after 11 months of operation using the hot zeolite water system



Comparison of Water Treatment Systems

Column 1 — Raw water
Column 2 — After treatment in original two-stage hot lime-soda-phosphate softener
Column 3 — Single-stage hot lime-soda softener
Column 4 — Single-stage hot lime-soda softener and hot zeolite

Cations*—		1	2	3	4
Calcium	(Hardness)	80	0-2	22	0-1
Magnesium		55	0-2	12	0-1
Sodium		53	165	108	141
Total cations		188	167	142	142
Total hardness		135	0-2	34	0-1
M. O. alkalinity		76	55	30	30
Total dissolved solids		188	167	142	142

*As $CaCo_3$

1. Meters are received from the manufacturer on pallets, then placed on "flats" and moved to the storage area. When testing begins, the pallets are broken open and the carton tops are cut on three sides. The meters are removed from the cartons, the covers taken off, and the company number badges are put on. At this time the register, hands, and mesh are checked. The cover is replaced, and the meters are put on a cafeteria tray, four to a tray. The tray travels on a 15-ft "skate wheel" gravity conveyor, which delivers meters to the bench.

2. Each meter is placed in the socket, where pneumatic jaws clamp the blades in place and provide electrical contact. A solenoid "fail safe" latch holds the meter in place in event the air or power fails. The light source has been prefocused for the kind of meter being tested. When the start button is pressed, the test meter and standard are energized, and the relays in the board are preset to count.

PG and E's new meter tester . . .

Ups Production 255%

W. D. Shattuck

Pacific Gas and Electric Co.
Oakland, Calif.

A new automatic "One Revolution" meter test bench, recently installed in the East Bay Meter Shop of Pacific Gas and Electric Co., will nearly *triple* the output of the older manual test setup. This bench is the first of its kind west of the Mississippi. It receives its name from the fact that it tests a three-wire single-phase meter in one revolution for each of the loads used. It's all over in 54 seconds—that fast!

The manual test benches averaged about 125 new three-wire single-phase meters per day. Last year's run was approximately 18,000 meters. In actual runs, with the automatic test bench, the average was about 40 meters per hour, or 320 meters per day. The increased volume has justified the installation of the equipment.

The new test bench is designed around a standard meter. It has 250 equally spaced slots cut around the disk through which a light beam shines. This light is broken up four times by an optical grating before it strikes a photoelectric cell, giving 1,000 pulses for each revolution of the disk. These pulses become the input to the amplifier of an electronic counter and printer.

The front panel has rotary switches, which control the current and voltage ranges. Potentiometers accurately control the voltage and current applied to the meter under test. Push buttons omit or include each of the tests available: full load, 50% power factor and light load. A Kh selector matches one revolution of the standard meter to one revolution of the test meter.

The standard meter has full-load current applied to it on all loads, and therefore needs only full-load calibration. For light-load runs the standard meter makes 10 revolutions, but an electronic circuit discards all but 10% of the pulses and these are compared with the test meter's pulses resulting from one revolution.

The counter is a standard electronic counter, operating on the binary principle. This printer is a modified adding machine with the accumulator removed to speed up operation, and its keys operated by solenoids. The readout and print operations take approximately .9 second.

3. During the running time of 54 seconds, a prestamped history card is filled out with the results of the test and the manufacturer's number. The prestamped card has the size, type and manufacturer's name rubber stamped, and the company number put on with a numbering machine.

4. After one revolution the scanner reads out the results as either correction factor or per-cent registration, to an automatic printer that prints it on a tape. This pulse also presets the relays for the next operation. A time-delay relay keeps the meter running at full-load speed until just before the next creep hole is under the light beam. The pulse from this creep hole opens the electronic gate for the next test run, either 50% full load or light load. After one revolution a pulse closes the gate and the scanner reads out the result, which is again printed on the tape. At the end of the selected tests, the meter stops and a light marked "End of Sequence" lights. In each step of the test sequence, the relays are preset so that the operation is pulse controlled, eliminating time delay of relays opening or closing.

When the start button is pressed on the test bench, tape on the printer is advanced a space, thus grouping each series of tests on the tape. The keys on the printer can be operated manually to enter the meter number on the tape, if desired.

The results printed on the tape can be expressed as correction factor or as per cent of registration. The keys on the printer can be operated manually to enter the meter number on the tape just prior to the printed results to give a printed record.

Since the new test bench tests meters much faster, it was felt that the system of meter handling should also be modernized. The new conveyor gave more convenience and at the same time moved the meters slowly to avoid jarring. The final arrangement handles one hour's supply of meters to and from the test bench.

5. When the meter test is completed, the meter is placed face down on a tray on the outgoing conveyor, which returns the meters to the handling area.

6. Here, the test links are checked closed, the meter sealed and placed back in the cartons. These are marked with the meter numbers and sealed shut with gummed paper tape. The cartons are stacked on flats and moved to the storage area, to await shipment.

Rough going, including grades to 45°, didn't slow Edison's plowing-in of cables

Edison plows in cable for . . .

Mountain Top Power

R. C. Blankenburg

Supervisor of Underground
Southern California Edison Co.

Southern California Edison recently "ripped in" 2,200 ft of 2-in. wire-armored cable to supply power to a Civil Aeronautics Authority beacon. The cable route was from the 4,900-ft peak over grades from 20° to 45°—rough country.

The beacon's requirement for continuous service, and the fact that the remote mountain top would be inaccessible to trucks for extended periods during the winter, made underground service advantageous. Deep snow, high winds and sleet are typical winter hazards. Underground cable would resist these exposures, and the wire armor protects against rodents and gives strength to withstand earth movements or cable slippage on the slopes.

Economic comparisons showed plowed-in cable to be higher in first cost than conventional overhead construction, but substantially less than overhead lines built to be as stormproof as possible. From a lifetime cost point of view, the plowed-in cable would probably be less expensive than either the conventional or maximum strength open wire pole line.

A ripper with long, narrow blade is used to rip a slot through the earth. The slot is about 4 in. wide and 2 ft or more deep. A conduit bend, or similar device, welded to back of blade follows it along the slot. Cable feeds through this and falls into place at bottom of slot as the rig moves along the route. Cable is supplied from reel mounted in frame on ripper carriage.

The rig is pulled by a tractor with a bulldozer blade. Blade helps clear brush and serves as an emergency brake.

Route for cable is typically an approach ridge running from the mountain top site to the power source at lower levels. Portions of routes chosen are frequently too steep for the tractor to return uphill for additional reels of cable.

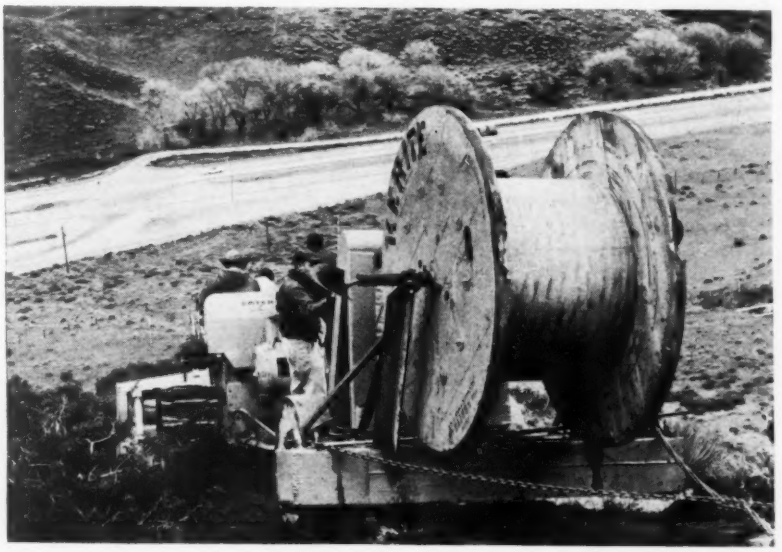
Dry Run Speeds Laying

Typically, a dry run is made over the route. Rocky areas too stout for the ripper can be dug out by hand, concealed boulders can be detoured. Where dry run is omitted, it may be necessary to lower cable by hand digging where rocks have forced the ripper up.

Cable may also be carried on the tractor. Two reel lengths may be placed before returning for more cable.

Typical cable laying rates to date have been about 1,500 ft per hour following a dry run without cable. The dry-run time can be expected to average about the same.

Plowed-in circuits have been used only in areas which are undeveloped and can be expected to remain undeveloped for many years to come.



Laying took place from top down, after trial run. Laying averaged 1,500 ft/hr

ELECTRICAL WEST
Construction News

For
- contractors
- consulting engineers
- lighting engineers
- wiring designers
- distributor salesmen
- all interested

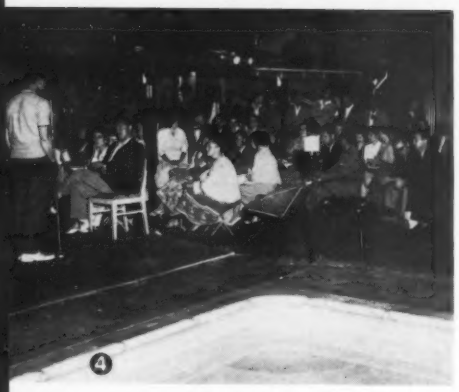
Annual Architects and Engineers Dinner given by Rocky Mountain Chapter, NECA, to more than 100 architects and engineers at Denver Athletic Club May 12 was addressed by Col. Charles P. Bobe, research director of NECA, from St. Louis. (1) Harris Steele, Reliable Electric Co., chapter president, welcomed the architects and Ralph E. Johnson, Sturgeon Electric Co., was meeting chairman. Chapter members and their architect guests joined the Denver group from Casper, Cheyenne and Boulder. Bobe stressed the work of the Building Research Institute to coordinate various segments of the industry.

A tool show for its contractor and industrial customers was staged by Graybar's San Francisco district under the direction of W. C. White, manager, inside construction sales. Spread over a portion of the parking lot and inside the service desk area, manufacturers' representatives demonstrated the various tools. Gordon Colwill, general sales manager, inside construction, New York City (seen in picture 2 with San Jose contractor Roy Butcher), visited with the 150 or more customers who attended during the day, June 13. Exhibitors included Black Hawk, Diamond Expansion Bolt, Ideal Industries Inc., Jet Line Gun, National Electric Products, Nye Tool, Price & Rutzebeck, Square D, Thomas & Betts, Acme Steel-Dexion Division, Thor Power Tool, Velocity Power Tool, Moe Residential Lighting.

Mike Wright, Ets-Hokin & Galvan manager in San Mateo, is the new president of the Electric Club of San Mateo County, succeeding Sil Chaippari, North State Electric Co. (3) Bob Frank, Peninsula and San Francisco Electrical Contractors Assns., was re-elected secretary-treasurer. Other officers are Bill Hilton, PG and E, vice-president; Ira Allen, California Department of Safety; Bill Breckenridge, San Mateo County assistant building inspector; and George Merhlien, National Electric Supply.

Bellingham Division of the Puget Sound Chapter, NECA, has been formed with Bill Zwaschka as chairman and Gene Hulford, vice-chairman. The group started off with six new members and now numbers eight.

Strikes in the building industry in the Salt Lake City area, although not of electricians, seriously affected electrical construction of major projects of late. There was hope that the general contractors' offer to the bricklayers and iron workers might end the stalemate.



Garden lighting teamwork among members of the San Jose Chapter, Illuminating Engineering Society, produced an outstanding demonstration meeting June 18 in the garden of George Harter, NECA chapter manager. (4) Garden lighting equipment and installation labor was contributed by George Mitchell, Advance Electric; Paul Leslie, All-Cal Electric; Merle Humber, Humber & Walker; Dave Lamson, G-E Lamp Division; L. K. Bishop and Greggor MacGregor, Owens-Corning Fiberglas; Sam Pecota, Santora Electric; Bud Howard and Walter Goeppe, Shalda Mfg. Co.; Tom Ramsay, Hodges & Glomb; Howard Guilbert and Jim Messina, Service Electric Supply; Red Owen; Jim Sardella, S&S Electric; and Bob Gilbreath, Zinsco Electric Products; George Baker, Rex Gardiner, Stan Blois and Ed Dunckelmann of PG and E.

Fall area meetings of National Association of Electrical Distributors will be in the nature of two-day conventions with manufacturers and the members and their wives attending, according to word from Ralph Rohrbach, Western Regional vice-president (5), and William Jewell, secretary-manager. The first will be for the Northwest members in Spokane or Seattle, Sept. 12 and 13. The central California and northern California group meets at the Flamingo in Santa Rosa Sept. 19 and 20. Southern California and Arizona members will meet probably at El Mirador, Palm Springs, Nov. 11 and 12. Originally the date had been set for Oct. 3 and 4.

Council decisions on pay increases in the Spokane, Wenatchee, Pasco, Seattle, Everett, Bremerton and Stockton cases were uniformly 25¢ an hour and for the two-year agreement in Cheyenne and Denver a 20¢ increase July 1958, with another 15¢ July 1959. Albuquerque two-year agreement got 12½¢ this year and 10¢ next year.

Pay increase of 25¢ an hour was not put into effect at Everett, Wash., even though awarded in a council decision, pending clarification of some travel pay problems created by the council change in this part of the agreement.

Everett F. Cogan (6), newly appointed secretary-treasurer of IAEI, will make the annual meetings of the Northwestern (Billings, Mont., Sept. 15-17) and Southwestern Sections (at Disneyland, Sept. 22-24). Cogan is no stranger to the West, having attended many meetings since his appointment as technical assistant secretary to the late Charles Smith. He was born in New Orleans and later was an electrical inspector there, both for the city and for the Louisiana Rating & Fire Prevention Bureau.

Don't be surprised if you see Gar Morse, for some years the popular Western sales manager for Sylvania, tour the West again but in a 1901 Oldsmobile (7) to celebrate Sylvania's 57 years in the lighting industry. Several Western Sylvanians attended the combined anniversary and sales meeting in Washington, D. C., to launch a sales drive for lighting products.

Unexpected antics of

Grounding Transformers—IV

Tom Hughes, Electrical Safety Engineer, California Division of Safety

We still don't know enough about the nature of the grounding transformer to apply it properly; so don't go away. It is because there are so many ifs and buts about it that the utility companies would be pleased if the critter were ruled out of existence.

Among other things, notice that we stipulated the "60-cycle fundamental" unbalance current when talking about the current the neutral must handle. Because of the complex system of magnetomotive forces produced in the core of a three-phase transformer (not an autotransformer) hysteresis is a problem. One of the effects of this hysteresis in the core is the generation of odd harmonies of the fundamental (60 cycle).

In a delta winding, the third harmonic emf (electromotive force) is not realized because it is circulated within the confines of the winding. However, the third harmonic emf produced in the three windings of a wye-connected secondary can pass outside of the winding by way of a neutral conductor. The greatest production of third harmonic occurs when the transformer is handling a balanced load and, of course, it is accentuated when the load is an inductive reactance.

The unexepected feature of odd harmonics is that their emfs from the three legs of the transformer are in phase and thus additive. It has been learned by tests that one can impress a flow of current in the neutral of a balanced three-phase system that will overheat it, if it is not as large as one of the phase conductors.

In the past, wye secondaries have been used to supply straight three-phase load at 480 v, with no neutral involved. If the plant was supplied from a delta secondary and grounding of the system was desired, a grounding transformer was applied; but still no neutral. In this case the metal raceway system would serve as a path for any fault current back to the wye point of the grounding transformer.

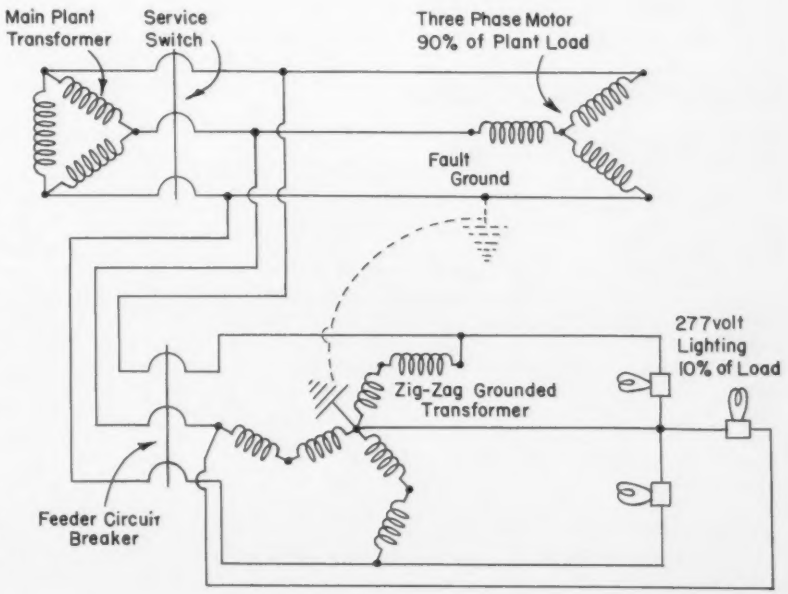
Considering this use of the raceway as a fault return path, many plant engineers require the use of rigid conduit and threaded fittings on all 480-v circuits. Some even go so far as to provide additional bonding jumpers where feeder conduits terminate in knockouts at a gutter or switch box.

The advent of 277-v lighting, with single-phase lighting loads distributed over the three phases of the 480-v supply, has brought the first regular use of a neutral with 480-v systems. So it was natural that a lot of confused thinking would evolve from this expanded use of the grounding transformer and that third harmonic currents would sneak up on all of us who were used to thinking of single-phase neutrals as working only with unbalance circulating current between loads of opposite polarity.

The plant engineers said they were using their grounding transformer to obtain a ground for their delta system. So the prospective users of 277-v lighting said, "We will use it to obtain a neutral for our lighting circuits." And the grounding transformer does this job in an excellent manner because it forces unbalance current to divide between all three legs of its windings just as it does with third harmonic or fault current.

But here is the sad error in visualizing the picture. When we say we are using it to obtain a neutral, we think of distributing small zigzag pots around at the different lighted areas as we put a small "lighter" pot at each farm house along a country road. And this is where we are way off the beam.

Regardless of what you or I may say we are using a grounding transformer for, it is still a passer of fault current (zero sequence current) and it is prepared to pass plenty of it. But the difference between our



grounding transformer and the little 7.5-kva pot at the farm house is that it *does not* produce the fault current it handles while the farm house pot does.

The point we want to make and the point that concerns the utility companies is that, regardless of where you place a grounding transformer in your plant, the abnormal fault current resulting from an accidental low-impedance ground at any point in the system must be supplied to the grounding transformer through intervening feeders and equipment.

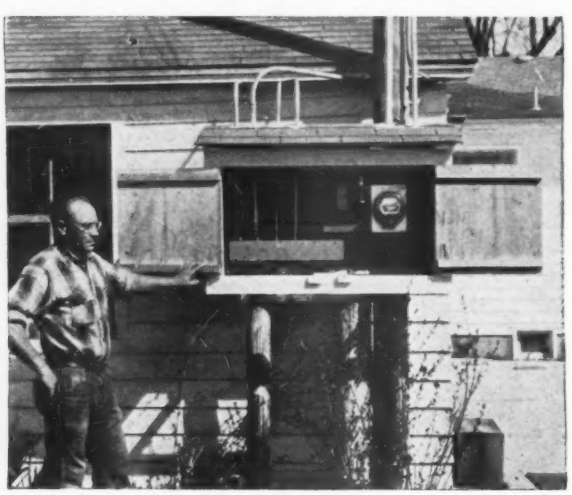
This is illustrated in Fig. 6. We see the proposed use of a grounding transformer for obtaining a neutral over at one building, where they propose to use 277-v lighting. We see that a fault ground in another portion of the plant produces a flow of fault current (dashed line) through the earth to the ground of the grounding transformer, wherever it is located.

This fault current may flow directly through the earth, if these feeders to the lighting load are run as open overhead conductors between buildings. On the other hand, if the earth conduction is poor and the feeders are run in a conduit with good bonding and continuity, the fault current (between ground symbols) may parallel the feeder conductors, using the conduit as its path.

But hearkening back to the complex grouping of arrows (indicating flow of currents) in Fig. 3 (EWest, May, p 83) we realize that those feeders between the service switch and the grounding transformer are going to have to accommodate the fault current that the main transformer feeds into the fault. It must be evident, then, that these feeders and any associated equipment may be smoking before the circuit is opened.

Thus we see what a bewildering train of events can occur if two plants are fed from the same transformer bank with a grounding transformer applied in one and a ground fault occurring in the other.

(*Next article — Applying the Grounding Transformer*)



Service pole installed near the farmhouse with a housing to protect equipment from rain. Yard light is mounted at top of pole

Idaho Farmers Like Service Pole Idea

Installation of a 30-ft service pole in a central location in the farmyard is proving to be both popular and a most effective way to wire up a farm for electric service in Idaho's fast developing Rupert-Hazelton area. There a large number of veterans have taken up homesteads. As they are assigned acreage, the Bureau of Reclamation assembles them in meetings at which Idaho Power representatives discuss their power needs and extension policy.

They are advised to have a contractor erect a 30-ft yard pole to which the company will bring the service drop. Some contractors make up such poles and equip them in advance. On such a pole they install the main disconnect, meter socket, conduit and switches for runs to other buildings. This provides:

1. Construction power for the erection of home and buildings.
2. Centralized distribution point to all farm buildings, with economical distribution to each and flexibility to add later without contact to the power company for added service facilities.
3. Fire protection power. If the pole is near the pump house, an added switch ahead of the main disconnects will provide power to the pumps to fight a fire even if the main fuses are blown.
4. Central location for a yard light and for lines to other yard lights as needed. For four cents a night a light can be burned all night—low-cost insurance against theft and vandalism, aside from being a tremendous convenience.

Raintight equipment is recommended to the customer. Where the cost is objected to, a wooden housing or enclosure for the switching equipment is often fashioned either by the electrical contractor or the farmer himself.

Of some 500 veterans located in the area E. E. Haroldsen, division sales manager, Idaho Power Co. at Twin Falls, estimates only eight have not installed such a service pole. Of all the others, the minimum service is 100 amp. There are quite a number of 200 amp and a couple of 400 amp. The latter are using electric heat very successfully.

The average domestic consumption for all such farms has approximated 10,000 kwh per year per customer. For customers whose time on the company's lines has averaged only three years, this is considered outstanding.

In serving this area, the company inaugurated a 20/34.5-kv distribution system and for the past two years has been installing a minimum of 10-kva transformers and using triplex service drops. All meters are of the extended range variety.

Calls upon grade A dairies by the agricultural representative and farm salesmen have sold the use of the service pole distribution system to many of these large-use customers. These rewiring jobs run from $500 to $1,500 and in all cases the farmer has been well satisfied with his new installation.

Displays of the service pole and a wiring panel at farm fairs have been used by Idaho Power as another means of promoting more adequate Farmpower. At such displays, usually outdoors in the fair grounds, the farmers have a chance to see the equipment, ask questions and have them answered. The central service pole idea appeals to them. It is so practical.

Art Voight (left picture) talks on computer applications. Break between conference sessions gives opportunity for rehashing

Northwest Accountants Study

Personnel and Public Relations

The accent was on personnel training and the application of electronic accounting equipment, at the Golden Aniversary meeting of the Accounting and Business Practice Conference of the Northwest Electric Light & Power Assn. in June. Held at Seattle's Olympic Hotel, the conference attracted some 100 delegates and more than 50 wives.

In the words of General Chairman J. E. Anderson of Puget Sound Power & Light Co.:

"The program objectives are to bring into focus the many fields to which accounting is directly related, and to emphasize the responsibilities which accounting personnel are accepting in developing more effective and well-rounded performance in the utility field."

In his keynote address, George Brunzell, executive vice-president of Washington Water Power Co., remarked on the integration of accounting departments' activities into such utility functions as sales and promotion and public relations. He presented the thought that accounting employees make up an important part of a utility company's biggest and best public relations tool — its personnel.

Speaking on the subject "The Development of 'Company' Men," Harry J. Prior, a partner in Booz, Allen & Hamilton, management consultants, made eye-opening statements about a noticeable deficiency in the training of future executives of utility companies.

"It is not uncommon to find a utility company worrying about and planning for its hydroelectric or other power generating facilities 10, 20 or 30 years in advance of requirements. But it isn't very often that you find a utility company that is planning its executive requirements on much more than a year-to-year—yes, even a day-to-day—basis."

Prior went on to say, "And yet, I firmly believe that proper organization and key personnel planning can mean as much or more to the future profits of the enterprise than the planning for physical facilities."

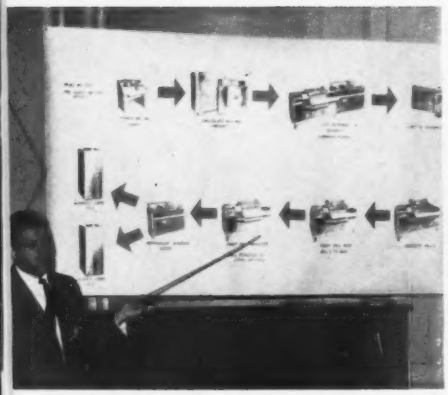
Five points made by Prior are: (1) The need for executives is growing at a more rapid pace than the available supply; (2) most of the executive requirements for the future are going to have to be built from within the company; (3) the natural process of "letting the cream rise to the top" will not supply either the qual-

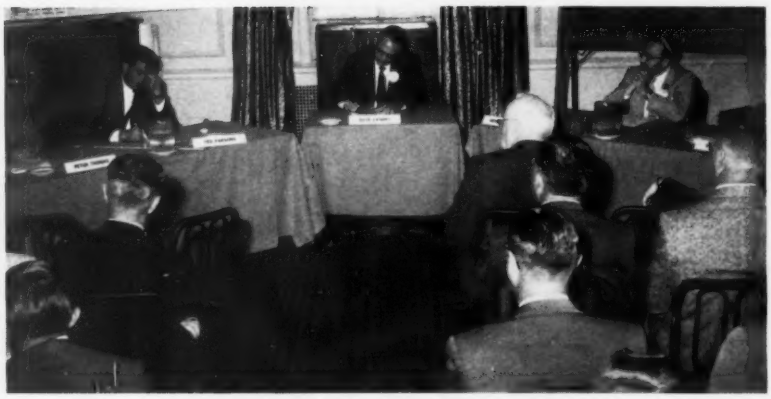
H. L. Clark
PGE

J. S. Purvis
BCE

E. H. Duffy
Montana Power

Lloyd Hammer
Utah P&L





Ted Parsons describes computer setup at Puget P&L and panel takes up the subject to answer questions from the floor

ity or quantity of executives needed to meet tomorrow's needs; (4) there are effective methods available through which the executive development program of your company can be accelerated and improved; (5) the successful utility company of the future will do long-range planning in the area of organization and management personnel, as well as planning its power supply.

With the meeting featuring an emphasis on personnel training, the "short courses" conducted by Dr. Thomas R. Nilsen, Department of Speech, University of Washington, were appropriate. He directed sessions on "How To Conduct A Panel Discussion"—how to plan a conference, ways to better communication, the use of the panel in conferences, and contributed many hints on speaking, including the use of case histories to illustrate or demonstrate the operation of certain principles in real-life situations.

Roland Blantz, manager of safety and training for Portland General Electric Co., presented "An Introduction to Speed Reading." Advantages are many but, basically, speed reading is a way to increase employee output without costly office space, desks, chairs and without additional help. He had described tachistoscope training to the group, and stated that it appeals to employees because it makes their work easier and more pleasant; and that it appeals to management because it increases production and improves accuracy.

The human element in accounting carried on through sessions on the training and supervision of office employees, and specifically accounting personnel, under the direction of Prof. T. J. Barnowe, professor of human relations and administration, University of Washington; H. L. Clark, Portland General Electric Co.; W. P. Evans, Utah Power & Light Co.; Al Gleason, California Oregon Power Co.; and C. W. West, Montana Power Co. Throughout all of the sessions, old and popular methods of personnel training were held up side by side with more modern concepts, resulting in an opportunity for delegates to look deep into such things as employee motivation and attitudes and changes in behavior.

Through the medium of panel discussions on electronic applications in the utility industry, delegates exchanged many ideas and much valuable information based on their own experiences in taking computers into their operations.

Art Voigt, manager in administrative services for Arthur Andersen & Co., presented "A Current Evaluation Of Electronic Applications In The Utility Industry" to establish a "guide post" for further discussion. Separate panel sessions, then, devoted to general accounting and customers' accounting took up the subjects of "Application of Computers To Materials And Supplies, Pay Roll And Construction," under E. S. Gardiner, British Columbia Electric Co. Ltd.; and "Application of Computers To ARC Functions," under the guidance of Dave Landry, Pacific Power & Light Co.

Francis Pearson, chairman of the Washington Public Service Commission, called upon the utilities to help with the tremendous communication problem that is faced in explaining to all of the interested organizations and people what the regulation of utilities might mean. With the idea in mind that an understanding of regulation on the part of the public would help both the commission and the utility companies, Pearson sug-

E. E. Smith PP&L | **W. P. Evans** Utah P&L | **K. R. Kraus** PGE | **M. C. Oliason** Idaho Power | **V. O. Burns** Puget P&L

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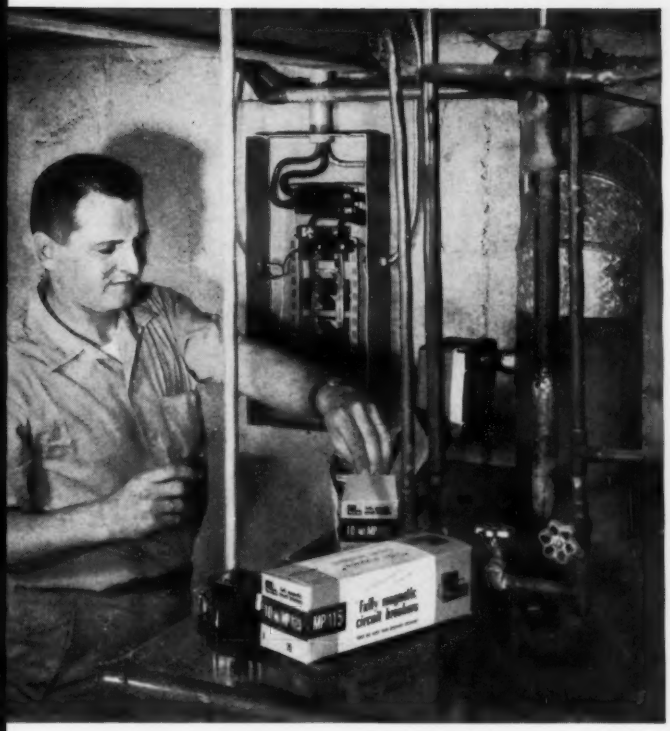

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Best of all, "MP" breakers — backed by a full line of plug-in "MP" load centers — cost no more than ordinary breakers.

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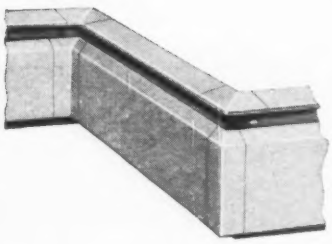
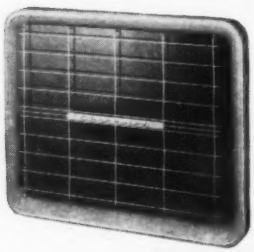
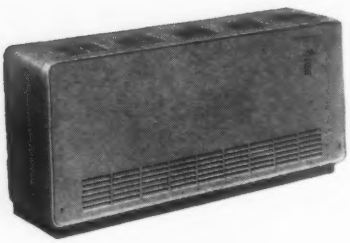


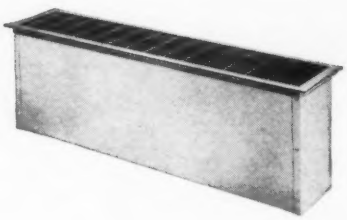
Chromalox Baseboard Heater



Chromalox All-metal Radiant Panel



Chromalox Electric Unit Ventilator



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gested that utilities should have people with a full understanding of regulation who would attend various association meetings, civic or fraternal groups, unions, granges or whatever to explain how the utilities are regulated by the commission and what the commission expects of the utilities.

Emphasized in Pearson's presentation was the obligation of a utility to have the most capable and efficient management. And then the management should assure itself that the types of employees in the organization are people highly qualified in their divisions, informed on the entire organization as well as the technical side of their departments. His suggestion brought out again the thought that utility employees are effective public relations tools.

On the subject of regulation C. A. Ashby Jr., manager, rate department, Stone & Webster Services Corp., followed through with a talk on regulation as it pertains to rates. He discussed the various components of the rate base, expenses considered chargeable to the rate payer, and rate of return. Using a number of rate case decisions, Ashby brought out the trend in regulation on recent rate cases. "All commissions know," he said, "that inflation means higher rates. They are not going to tell you to apply for rate increases as soon as your earnings start to slide. That is the responsibility of the company."

Ashby said that Stone & Webster recommends that companies seek a closer and continuing relationship with the commissions and staffs themselves so that all concerned are kept up to date on current and pending matters. "Only by doing this can the benefits of mutual and thorough understanding of common problems be achieved." Once again, the subject of good public relations came forth when Ashby said, "Both the companies and commissions are concerned with consumer opinion, and good public relations are vital. Good regulation means good for all three: the consumer, the company and the investor. Rate schedules should and will reflect good regulation."

Committee members of the 33rd annual conference were: J. E. Anderson, general chairman; J. H. Abramson, arrangements; J. H. King, V. O. Burns and C. B. Schoeggl, business program; F. C. Frost and J. W. Hillier, banquet and entertainment; E. Jensen, finance and budget; W. C. Dudley, W. H. Biggs and H. E. Klein, registration and hotel reservations; T. H. Parsons, ladies' entertainment; and R. F. Whaley, transportation.

New Sears, Roebuck and Co. Store at Nashville has 178,961 sq ft of floor space. All wiring is protected by SPANG HD and SPANGLEAM EMT.

"SPANG® Conduit's easy handling saved us installation time"

says Mr. Leon Harlan, Ramsey Electric Co., Nashville, Tennessee

59,000 ft of SPANGLEAM EMT, 77,170 ft of SPANG HD went into this store. Easy handling of conduit saved time, kept costs down.

"We installed 77,170 ft of SPANG HD Galvanized Conduit and 59,000 ft of SPANGLEAM EMT to protect the wiring in the new Sears, Roebuck & Co. store at Nashville, Tennessee," reports Mr. Harlan. "Because it was so easy to work with, we saved considerable time on installation which also helped keep costs down.

"SPANG HD was easy to cut and thread. Bending was fast and accurate. The conduit was clean and free of burrs and obstructions which otherwise might have caused trouble on wire pulling.

"We used SPANGLEAM EMT for short runs, and we had good results with it, too. The EMT was delivered bundled with blue plastic tape instead of rope. This was an important safety factor, because the tape makes a strong bundle and lengths don't slip out of place."

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Problems of Management—VIII

Handling Employee Grievances

Joseph G. Phelan, Ph.D., Personnel Development Counselor, Bechtel Corp.

One of the most important and difficult questions that every supervisor must ask himself from time to time is, "Am I cultivating the right attitude toward grievances?"

It is an important question because no business is any stronger than the esprit de corps and good will of the people on its pay roll. It is a difficult question because it demands an honest self-appraisal and because it allows no easy answer.

All of us feel we are willing to hear complaints. We set up simple or involved systems for dealing with them. We use attitude surveys to track down grievances that haven't come to the surface.

The trouble is that although we can do all of these things, at the same time we resent the complaints. Without realizing it, perhaps we treat those that get through to us as annoying interruptions to whatever we think is our real job.

Here are some ways of preventing grievances from developing:

1. Deal with each employee as with an individual. This means letting the man know how important his job is, letting him know exactly where he stands, and showing him that his needs for further development in the organization are under constant consideration.

2. Surprise the subordinate by asking about his feelings of happiness or job satisfaction. You will be less likely to find anonymous written gripes on questionnaire forms on your desk.

3. Learn to delegate responsibility and the degrees of authority that go with it.

4. Build the right employee-boss relationship—not too distant and not too familiar, but mutually respectful and trusting.

5. Try to get to know your people — their personalities, attitudes and shortcomings.

When complaints *do* develop, try these ideas in handling them:

1. React to complaints without expressing feelings of resentment. Antagonism and aggression on your part will make it necessary for the complainer to retaliate, and the chances of your arriving at mutual understanding fade away.

2. Listen seriously to complaints even when you feel they are trivial, ridiculous or unjustifiable. This is a skill in itself, and one that deserves as much emphasis in the training of supervisors as the skills in reading, speaking and writing. A careless, impatient or inexpert listener will imperil the sincerity—and therefore the value—of the open-door policy. It is one thing to know that you need to maintain an open-door policy, but it takes skill to make such a policy work.

3. Try to get the facts, to be realistic. There are bound to be complaints or grievances—some will be based on reality and some will not. Don't be prejudiced against the complainer. Determine whether there are any grounds to his complaint or not, and decide what you can do about it.

4. Above all, get to the heart of the grievance. Try not to get sidetracked by details and irrelevancies. Find out what the employee is really complaining about and why.

5. Be fair. Strengthen your reputation for the qualities that people consider fair in an individual. If you handle every matter that comes up properly, you eventually find yourself dealing with more friendly and reasonable complaints.

The president of Du Pont once asked a young executive what single thing helped him most in his career. The young man said he could always feel free to think out loud with his superiors — to throw out crazy suggestions, talk over any subject without fear that he would be squelched. It had more effect on his development as a manager than anything else.

Adopting the right philosophy, striving constantly to create the right climate, will ultimately have the effect of taking care of many of the grievances we never get to hear about as well as those we do.

All Together Now—

In looking at the questions, doubt may arise as to why one of the answers is true or false. The subject of handling grievances calls on the use of many of the specific skills that have been discussed in previous articles. To date, we have treated these skills in test-tube form knowing that an adroit manager must be able to communicate, to delegate, to make decisions all at once.

While real skill in dealing with people takes time to achieve, there is an order involved in the process of dealing with people. Here it is.

1. Get your own thinking straight.

2. Understand the other man's viewpoint.

3. Devise a way to reconcile the viewpoints.

Notice that the questions, when answered honestly, cannot help but point to the real opportunity available of dealing correctly with people's grievances. Do you get the feeling that out of a healthy discussion will come real benefits for you—the person complaining and your company. Perhaps you will welcome or even encourage complaints once your thinking is right.

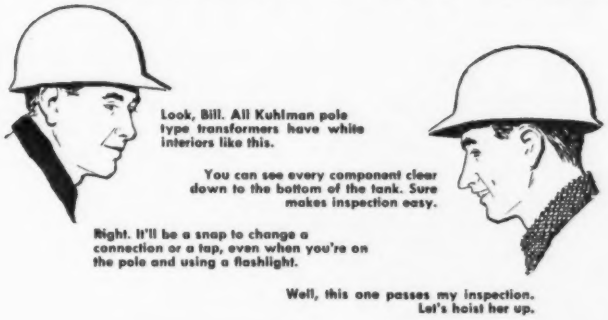
Skilled managers report that the solution to complaints is easy once they have a constructive attitude or have command of the other man's position. Here's a case where adroit management—constructively leaving out a fledgling manager—succeeded in making him grow.

Check Your Score on Test, Page 13

1. True	7. False
2. False	8. False
3. False	9. True
4. True	10. True
5. True	11. True
6. False	12. True

Linemen like this Feature...

KUHLMAN transformers are WHITE inside


Look, Bill. All Kuhlman pole type transformers have white interiors like this.
You can see every component clear down to the bottom of the tank. Sure makes inspection easy.
Right. It'll be a snap to change a connection or a tap, even when you're on the pole and using a flashlight.
Well, this one passes my inspection. Let's hoist her up.

White interiors—a Kuhlman exclusive—make periodic inspection faster and surer by helping the lineman see clearly all the way to the bottom. This much-appreciated feature doesn't add a penny to the cost, however. Kuhlman's dual-flow paint system sprays exterior gray and interior white simultaneously, preparing the tank for the bake oven in one operation.

Look into a light, *white* Kuhlman transformer. You'll see the advantage of white interiors right away!

KUHLMAN ELECTRIC COMPANY

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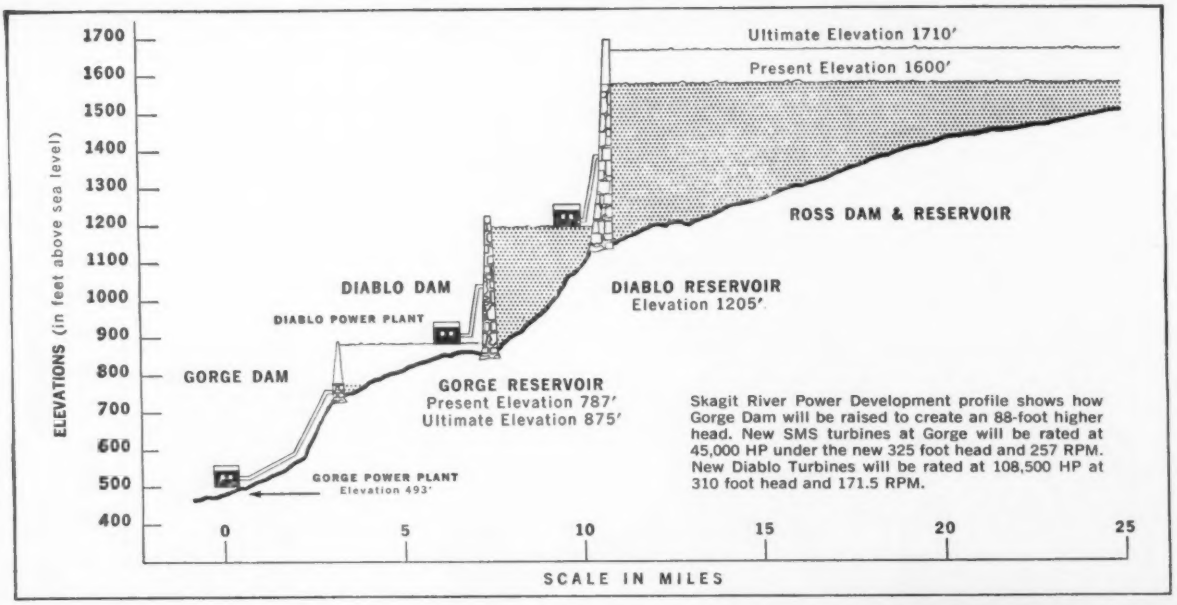
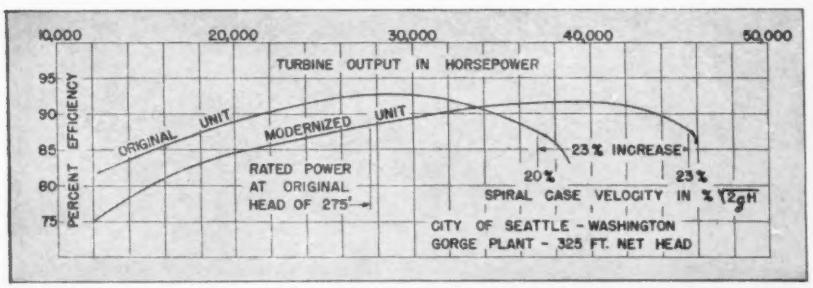
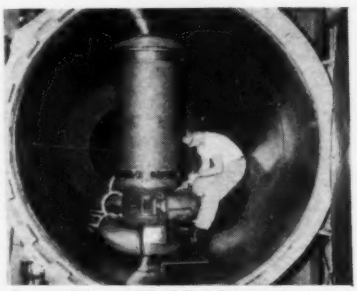


Skagit River Power Development profile shows how Gorge Dam will be raised to create an 88-foot higher head. New SMS turbines at Gorge will be rated at 45,000 HP under the new 325 foot head and 257 RPM. New Diablo Turbines will be rated at 108,500 HP at 310 foot head and 171.5 RPM.



This shows the Laboratory Test performance (power stepped up for head and size), of the existing Gorge runners under the higher head and the new runner and gate design for the same conditions.



A complete model of the Gorge wheel case assembly, built to extreme accuracy, is shown being mounted in the test chamber of the SMS high-head test stand.

CITY OF SEATTLE TO GET MORE POWER

New SMS Turbines In Modernization of Gorge, Diablo Facilities Will Help Increase Capacity 23%

As part of its program to get more power, Seattle, Washington's Skagit River development includes replacement of 35- and 22-year-old turbine runners at the Gorge and Diablo plants, and increasing the height of the Gorge Dam. Rebuilt vertical SMS-Francis runners and new wheel case accessories will give each unit 23% more capacity in the existing wheel cases.

Extensive model tests were conducted for these turbines in the SMS Laboratory's high-head test stand. They proved that the proposed new runner and modified gate designs would not only provide the increased power with very little loss in efficiency, but would have improved cavitation characteristics which permit maintaining the original setting above tailwater elevation.

Research results such as these indicate SMS can provide substantial economies in both new and existing installations with higher turbine speeds and settings as well as smaller spiral cases and inlet valves. A general discussion of turbine rehabilitation, as given at a recent technical presentation, is available without cost. Write on company letterhead to S. Morgan Smith Company, York, Pennsylvania.

More Power To . . .

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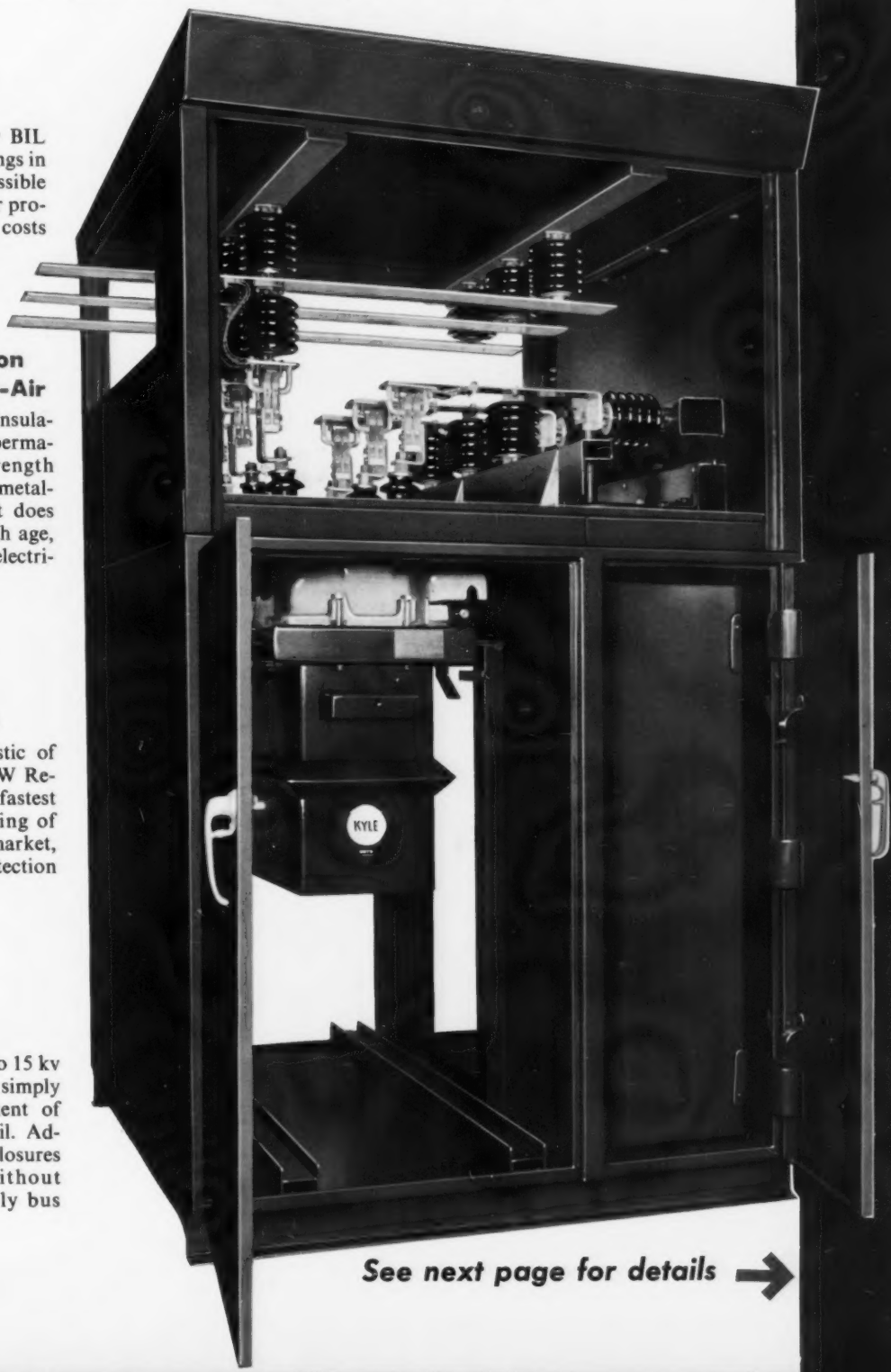
L-M Announces New Kyle® Metal-Enclosed Recloser

15 kv 110 kv BIL, Only $4,540

Here Is the Industry's First Three-Phase Standard Design Metal-Enclosed Recloser Switchgear.



Substantially Lower Cost

On a 15 kv 110 kv BIL unit, complete, savings in excess of 50% are possible for functional feeder protection. Installation costs are also less.

Major Insulation Porcelain-and-Air

Porcelain-and-air insulation gives higher permanent electrical strength than conventional metal-clad insulation. It does not deteriorate with age, heat, moisture, or electrical stress.

Faster Fault Clearing Time

This is characteristic of Kyle Type R and W Reclosers, which give fastest three-phase clearing of any device on the market, giving better protection to conductors.

Provisions For Future

A change from 5 to 15 kv in functional unit simply requires replacement of recloser closing coil. Additional feeder enclosures can be added without tedious and costly bus joint insulation.

See next page for details ➔

TEAR OUT ALONG THIS LINE, AND FILE THIS INFORMATION.

1. Porcelain bushings—which, with air insulation, give high impulse and corona levels, and greater permanent creepage strength than phenolic insulation.

2. High location of main bus permits normal operation in flood areas. Units can operate in over 2 feet of water without damage or service interruption.

3. Recloser primary and secondary connections are automatically made as recloser is raised into operating position. Bushings on recloser have special flexible self-aligning disconnects.

4. One of a number of troughs provided for low-voltage wiring.

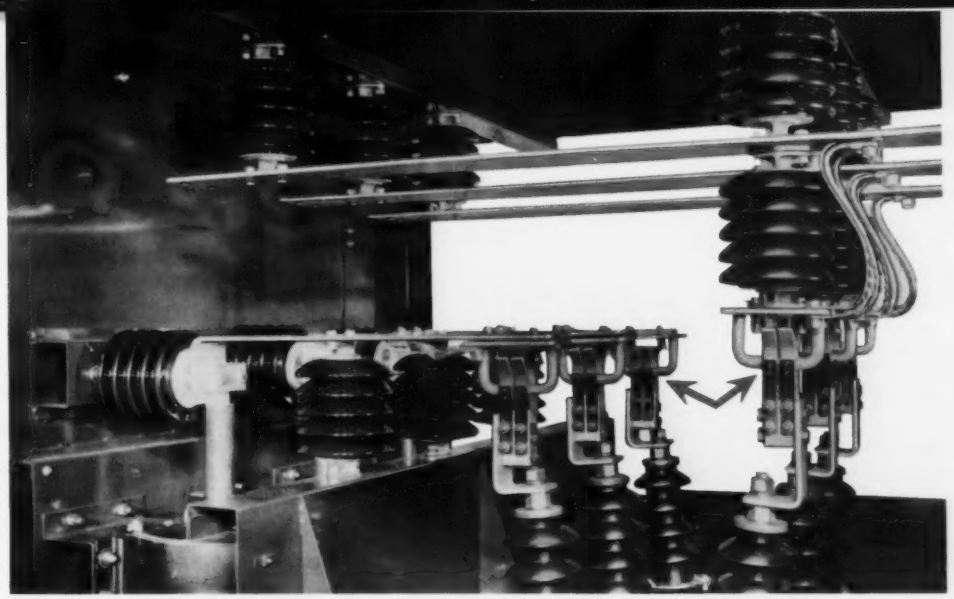
5. Type W Recloser. Type R may also be used where loads are smaller, and changed to Type W when situation necessitates.

6. Compact—takes from 10 to 25% less ground area (and a smaller pad), and 25 to 35% less volume than comparable metal-clad equipment.

REAR VIEW of feeder unit with all panels removed.

HYDRAULIC LIFT TRUCK. Recloser is easily removed, or inserted and locked into operating position. Mechanical interlocks make it impossible to insert recloser into primary contacts unless recloser is in OPEN position.

TEAR OUT ALONG THIS LINE, AND FILE THIS INFORMATION



DETAILS OF BUS COMPARTMENT showing current transformers and the ingenious arrangement for automatic connection of the recloser as it is raised into position. (Arrow)

New Kyle Metal-Enclosed Reclosers Offer Many Outstanding Features

Faster Clearing...Better Coordination...Lower Cost ...Porcelain-and-Air Major Insulation...Space Savings ...Provision for Future System Planning

FRANK McSTAY demonstrates accessibility of the meter compartment. The attractive low-line appearance of the Kyle enclosure makes it very desirable for urban areas. The unit is completely weatherized with phosphatized treatment, primer, and two coats of alkyd resin paint. Ventilators allow circulation of filtered air. Heaters prevent condensation of moisture.

by **FRANK W. McSTAY**, Product Manager
Kyle Switchgear, Line Material Industries

All of the well-known advantages of the Kyle Type W or Type R reclosers, plus simple, functional design, are now available in the new L-M metal-enclosed switchgear.

Cost As Low As $4,540

The units are simple and compact. They are highly efficient, and provide many advantages, at a substantially lower cost than that of the traditional metal-clad units. For example, the basic 15 kv 110 BIL feeder unit costs only $4,540.

Fastest Clearing Time

The reclosers themselves provide the fastest clearing, from fault initiation to arc extinction, of any device on the market. This high-speed clearing gives better protection to conductors against burndown and annealing, and thus assures better service continuity. Timing of the recloser is accomplished by self-contained time delay mechanisms which have indexed settings for specific time current characteristics. Kyle's usual wide choice of time current characteristics is available.

The units are quite flexible in many respects. There is a wide choice of optional equipment. Future expansion is easily handled, by either changing reclosers or adding additional feeder units. Space is provided in the auxiliary compartment for lightning protection. Many other features and options are available.

The units are compact, and installation is simple. They require less pad area, and therefore, less concrete. Fewer manhours are required for installation, offering additional savings. Thus Kyle equipment offers savings you cannot afford to ignore.

Get This Bulletin and Details From The L-M Field Engineer

Or write Mr. McStay at Kyle Products Division, Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY

Kyle® Switchgear

McGRAW EDISON

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Multiple feeder assembly with one auxiliary compartment at left end.

Many Optional Arrangements Available In New Kyle Metal-Enclosed Reclosers

by **LYLE McNULTY**
Application Engineer
and **CARL MERCIER**
Development Engineer
Kyle Switchgear
Line Material Industries

The new Kyle metal-enclosed switchgear is designed so that the basic unit is simple, functional, and extremely economical, offering substantial savings over traditional metal-clad.

But the design also makes possible a wide choice of variations, optional arrangements, and accessories to suit almost any requirements.

For simplicity, some of these variations are listed below. Complete details are available from the L-M Field Engineer, or by writing us at Kyle Products Division, Line Materials Industries, Milwaukee 1, Wisconsin. We will be glad to supply whatever information you wish, or to work out any arrangements you need.

The following variations and accessories are now available, or will be available shortly.

General

1. Choice of Kyle Type R or Type W Reclosers (ask for bulletins giving details).

2. 800, 1200, or 2000 ampere main bus section.

3. Roof bushing or throat circuit entrance to enclosure.

4. Formed weatherproof roof section for outdoor installation, or bolted panel roof section for vault application.

5. Window-type current transformers (110 kv BIL) or wound-type. Space permits installation of two window-type per phase, or one wound-type.

6. Observation windows may be located wherever desired.

7. Any metering or end devices which can be located on the metering panels.

8. Distribution or intermediate class lightning arresters if desired.

Auxiliary Enclosure

1. Gang-operated 800 or 1200-ampere blade-type disconnect, with or without 600-ampere load-current interrupters.

2. Fused disconnects.

3. Instrument potential transformers with current limiting fuses, and drawout type carriage for safety to operator.

4. Station control power transformer with current-limiting fused disconnect. Space will accommodate two 10 kva 14.4 kv distribution transformers and two fused disconnects.

Feeder Enclosure

1. Automatic shutters which close bushing ports when recloser is lowered.

2. Inclusion of any of the accessories available for the Types R and W Kyle Reclosers. (Bulletins available.)

3. Three-phase gang-operated pothead grounding switch.

4. Split bus for duplex operation.

5. Single-phase or three-phase potheads or condulet cable exit.

Let's Clear Up "Clearing Time"

The published time-current characteristics for Kyle oil circuit reclosers include the *total* time, from instant of fault initiation to the completion of arc extinction. This includes the complete fault sensing period, tripping time, and sufficient contact travel time for complete interruption.

Since the fault sensing and timing means is incorporated within the Kyle recloser, this recloser is independent of external devices, which themselves may add appreciable time to the operating time claimed for other devices.

Thus the 2 or 2½ cycles in which Kyle reclosers clear faults is appreciably less time than that required by devices usually incorporated in metal-clad equipment. Therefore, Kyle switchgear gives much better protection to conductors, and much better insurance of service continuity.

340

LINE MATERIAL Industries
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Kyle® Switchgear

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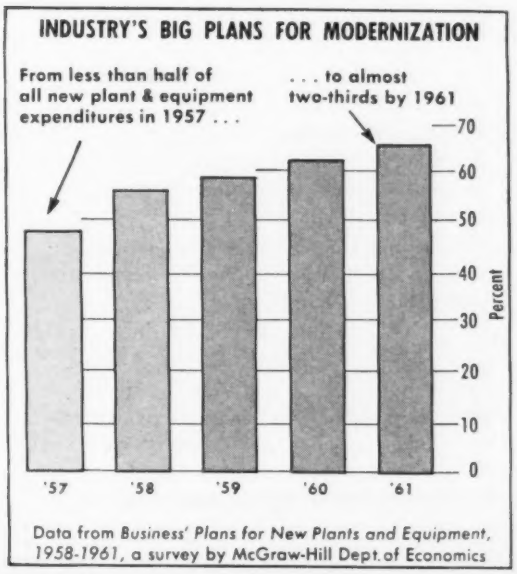
PLAN '59

A MESSAGE TO AMERICAN INDUSTRY

Modernize Now — For Growth and Profits

The biggest challenge facing American industry today is that of thoroughly modernizing its plant and equipment. This is the test period for companies to prepare for success — or failure — in the '60s. Success depends decisively on one key policy — modernization, for growth and profits.



Data from *Business' Plans for New Plants and Equipment, 1958-1961*, a survey by McGraw-Hill Dept. of Economics

The problem of business recession is fading. Sales and industrial production are moving up again, slowly. Business is swinging back into its normal course. This is growth, not retreat and recession. If the recovery takes us back to the normal growth trend, industrial production will be up 15% to 20% by 1960.

But how can we get this growth in production without the plague of price inflation that has blighted our economy in recent years? And, of fateful consequence for the individual business firm, how can it keep its costs down enough to make a decent profit — something a very large share of American companies are not doing today?

This is the new challenge that confronts business as the recession is left behind.

Nature of the Challenge

The recent record on costs and productivity is not reassuring. Since 1947 wages in manufacturing have risen 68%, while output per manhour has gone up 32%. This is a dismal record for a nation that has prided itself on

gains in industrial efficiency. Clearly, if we are to avoid continuing inflation, labor must key its wage demands more closely to productivity increases. But clearly, also, we must do far better in raising output per manhour. Otherwise, industry cannot hope to offer stable prices, and still make a profit.

What, then, is the answer? It is modernization of plant and equipment, the replacement of obsolete producing facilities with new and more efficient machinery and buildings. Only in this way can industry hope to increase production, hold down costs and make a good profit showing in the years of growth that lie ahead.

Industry's Answer

The chart on the preceding page shows how American industry is buckling down to the task of modernizing its facilities over the next four years. It is planning to replace old equipment with new machines that will raise output per worker not just 2% or 3% a year, but more like the 5% annual gain in productivity that this nation achieved in the years following World War I.

Since World War II we have had to contend with shortages of capacity and materials that have held back the job of raising productivity. But today the machines and techniques are available. And industry is getting set.

A broad sample of manufacturing companies surveyed by the McGraw-Hill Department of Economics earlier this year reported these plans: **In 1958, expenditures for modernization will rise to 56% of total investment in new facilities — compared to 48% in 1957. And this emphasis will increase until by 1961, expenditures for replacement and modernization account for two-thirds of all capital spending by manufacturing companies.** In dollar terms, manufacturers will spend more on modernization in each of the four years 1958-61 than in any previous year except 1957.

Can It Be Done?

These are big plans. Can they be carried out? Is it too visionary to hope that after a decade of expansion, industry can now find the outlets for huge amounts of capital investment in the area of modernization? The answers are important to business and the nation, because on this new wave of modernization depends our hope of holding down costs and prices, and also the prosperity of the vital capital goods industries — generators of boom and bust in our economy.

To ensure that industry gets the answers, McGraw-Hill's 34 business publications are now starting a coordinated effort — the largest editorial effort in the history of our company — to find, report and publish the opportunities for modernization at a profit, in the fields we serve. These special reports will begin in late September and will run through November, with appropriate coverage for the specific needs of each field. We are proud to share with industry the responsibility for making sure that no opportunity is overlooked in the drive to modernize now for growth and profits.

This message was prepared by the McGraw-Hill Department of Economics as the first step in our company-wide effort to report on opportunities for modernization in industry. The Department is also preparing a longer report, on modernization as a national problem, for publication in October.

Permission is freely extended to newspapers, groups or individuals to quote or reprint all parts of the present text.

Donald C. McGraw

PRESIDENT

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Greater ozone resistance than the best grades of rubber insulated cables.

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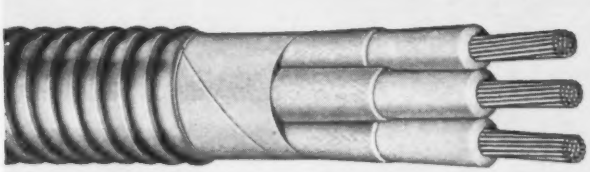
Long life — excellent resistance to weathering and aging.



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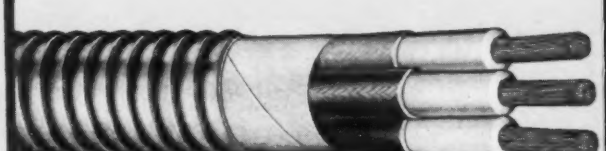
Silicone rubber insulated power cable combined in a 3 or 4 conductor conduit, with interlocked armor overall . . . easily installed with simple supports . . . eliminates conduit . . . greater current carrying capacity for economical power distribution.



MULTI-CONDUCTOR CONTROL CABLE

For use in steel mills, power stations, boiler rooms, automotive, ceramic and glass plants as well as other industries where control and signal circuits or control equipment are exposed to high ambient operating temperatures.

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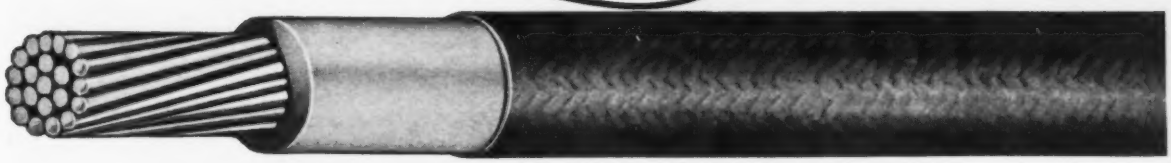
WIRES



SILICONE RUBBER INSULATED POWER CABLE 600 and 5000 VOLTS

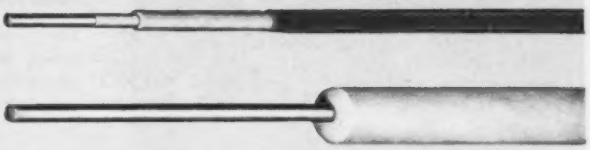
For high temperature circuits either in wet or dry locations, exposed or in conduit. This cable is recommended for use in steel mills, power stations, heat treat areas, boiler rooms, foundries, smelters, etc.

MOTOR LEAD and APPARATUS WIRES

For leads to motors, transformers, etc., requiring a flexible wire in high temperature locations or applications.

APPLIANCE and FIXTURE WIRES

For use in wiring high wattage units when operating temperatures reach 150°C and 200°C. Lighting fixtures, clothes dryers, electronic equipment, stoves, water heaters, ovens, therapeutic devices, space heaters are among the many products for which these wires are recommended.



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Heating cables are ideal for use in pipe heating, surface heating, roof de-icing and soil heating.

Defroster wires being odorless and tasteless are perfect for use as rapid defroster heating element in electric refrigerators and freezers.

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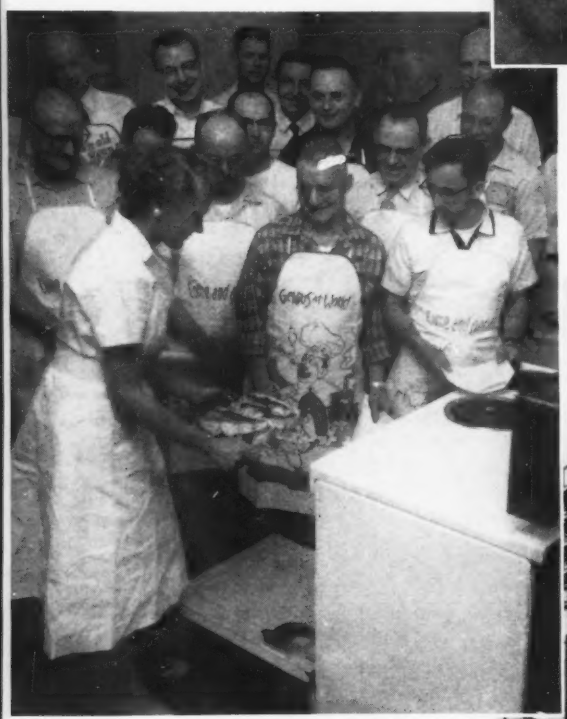
news

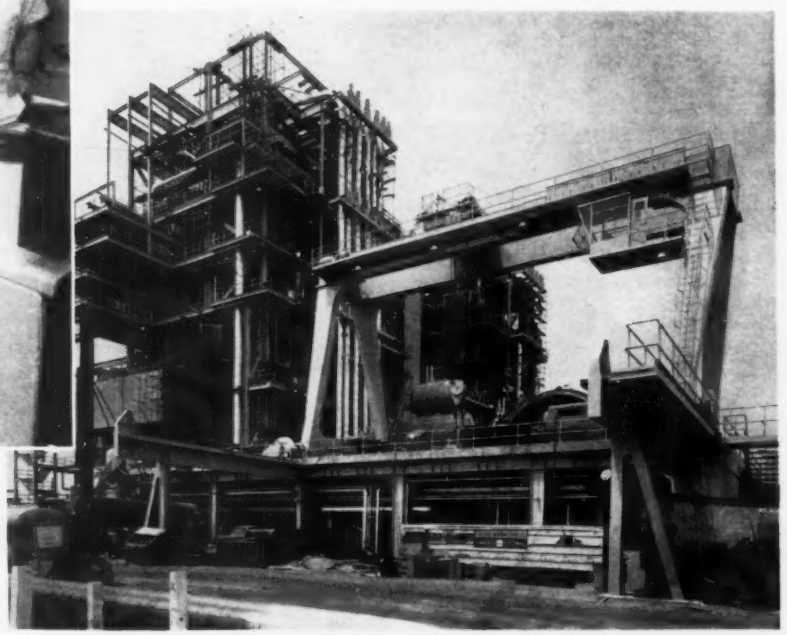
General Electric Co. engineers at the San Jose atomic power equipment department adjust a closed circuit television system that will be used to observe operations of a radiation effects reactor APED will furnish the Lockheed Aircraft Corp. nuclear test facility at Dawsonville, Ga. The RER is one of nine test reactors built or being built by APED for use by various companies and organizations in this country and abroad. The television system is part of the RER control panel shown here

Washington Water Power Co. expects to move into this new headquarters this month. The striking new office is beside the Spokane River. Landscaping was designed to add beauty to upgrade this section of Spokane. (Management)

The largest steam electric generating unit ever built on the Pacific Coast is now in operation at Huntington Beach station of Southern California Edison Co. An identical "sister" unit will be completed at the end of this year, bringing the total cost of the station to $58,000,000. (See Growth)



These men aren't amateur chefs—they are Seattle City Light appliance servicemen picking up pointers from Home Economist Mary Morris. The two-hour course was designed to help servicemen answer customer questions on use of accessories being featured on many new electric ranges



EW

Management

New A-Group

Eight Western power companies and General Dynamics Corp.'s General Atomic Division have banded together to form a nuclear research organization under the name of the Rocky Mountain-Pacific Nuclear Research Group. Purposes of the new study group are twofold. First it will concentrate on the development of gas-cooled power reactors and, second, it will study the new field of direct conversion of heat into electricity by thermal electric means.

A $500,000 contribution will be made by the eight-company group which consists of Arizona Public Service Co., Public Service Co. of Colorado, Public Service Co. of New Mexico, Utah Power & Light Co., California Electric Power Co., Pacific Power & Light Co., Portland General Electric Co. and The Washington Water Power Co. Work will be carried on at General Atomics Laboratories in San Diego.

The Rocky Mountain Nuclear Power Study Group, a nine-company organization founded in 1954, is being disbanded with five of its member companies now affiliated with the new organization.

Line Block

Northwest Public Power Assn. has filed informal complaint asking the FPC to halt joint construction by Idaho Power Co. and Washington Water Power Co. of a 230-kv transmission line from Idaho Power's Brownlee Dam to Lewiston, Idaho. Line contracts have been let and surveys completed but active construction is not yet under way.

The NWPPA complaint said analyzer board studies made jointly by Bonneville Power Administration and Idaho Power Co. showed that coordination of Brownlee with the Northwest Power Pool required "a shorter and much more economical line to Baker and thence to La Grande, Ore., for interconnection with existing high capacity transmission lines of the federal government."

The complaint did not mention that the Brownlee-Baker-La Grande interconnection is already in service. Idaho Power recently completed the final section from Brownlee to Baker. At La Grande, the line connects with BPA's 230-kv system.

NWPPA claims construction of the 111-mile line to Lewiton violates the "coordination clause of the FPC license for Brownlee Dam." But an Idaho Power spokesman said the $7,000,000 line will be needed for full coordination of the company's Snake River projects with the Northwest Power Pool.

The new proposed line consists of a 66-mile section to be built by Idaho Power from Oxbow Dam site to the Oregon-Idaho border close to the proposed site of Pacific Northwest Power Co.'s controversial Mountain Sheep Dam. From this point Washington Water Power will build a 42-mile section to Lewiston. There it will connect to a 106-mile, 230-kv line to Spokane, recently put in service by WWP which ties in with BPA at Spokane. Idaho Power shortly will build a required three-mile interconnection between Brownlee and Oxbow.

Construction Delays Costly

Delays due to litigation while various state agencies in Washington fought over the Tacoma City Light's right to build hydroelectric projects on the Cowlitz River have cost the city $2,634,443. The U. S. Supreme Court finally gave the green light to the Cowlitz River project in a unanimous decision which held that the city can condemn a state fish hatchery which blocks further construction of its Mayfield Dam.

Included in the costs of the delay were an $811,000 payment to the contractor for cancellation of the Mayfield Dam contract, a $900,000 loss of interest on money invested and $115,000 in legal expenses.

Meanwhile, the city council of Tacoma has approved payment of $180,000 annually to the Lewis County commissioners for expenses incurred by the Cowlitz dams. Terms call for a $15,000 annual payment for each of the four generators at Mayfield and $30,000 annually for each of the four generators at Mossyrock Dam, payment to start when generators go on the line. Payments are intended to compensate Lewis County for removal of nearly 12,400 acres of land in the dam reservoirs from the tax rolls.

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New Fish Story

The Washington State Department of Fisheries, which lost a round to the city of Tacoma (see above), has joined with Pacific Power & Light Co. in a long-range program aimed to increase the silver salmon and trout populations on the Lewis River in southwestern Washington. A hatchery is to be built on a tributary flowing into Lake Merwin behind Pacific Power's Merwin Dam. The hatchery will be designed to incubate and rear young silver salmon before they are released into the lake. A "skimmer" device is being readied to attract and collect year-old silver salmon for safe passage over the dam as they begin their migration to the ocean.

A second phase of the Lewis River project will include the construction of rearing ponds at the game department's hatchery at Vancouver, Wash., where steelhead and rainbow trout will be reared for stocking in the Lewis River below Merwin Dam and in the Swift Dam reservoir which is to be formed this fall.

► Portland General Electric Co. and the International Brotherhood of Electrical Workers, Local 125, have negotiated a new contract providing a 4% hourly increase in wages retroactive to March 1, 1958. This brings the scale for journeymen linemen to $3.10 an hour. The agreement also increased the company's monthly contribution per worker to hospital, medical and surgical plans from $5 to $6.

Contract Stirs Feelings

A hassle over private vs public power has been touched off over the awarding of a contract to the Moon Lake Electric Assn. of Vernal, Utah, to build a 115-kv transmission line into the Flaming Gorge site to supply construction power for that project. The cooperative is now installing two 7,000-kva diesel engines at its Rangely, Colo., plant as the power source, the diesels operating off natural gas produced with oil from the Rangely field.

Utah Power & Light and Southern Wyoming Utilities are extremely unhappy over the situation on two counts. Moon Lake received the contract after three bids were taken and two rejected by the USBR. On the first bid Southern Wyoming Utilities was low but the bid was thrown out on what were characterized as "flimsy" excuses. The second bid was not acted upon because at that time the appropriation for funds for Flaming Gorge had not been made by Congress. The third time Moon Lake was low.

On the second count, the investor-owned companies state that the line is of too large capacity for merely construction power and that the REA loan with which the diesels are being installed will be wasted after Flaming Gorge comes on the line and Moon Lake can reverse the power flow over the line. By building a line of this size, it is intimated that the cooperative is putting itself in a position to take advantage of preference clauses in the disposal of a large block of Flaming Gorge capacity. Power company officials have asked that the matter be investigated by Congress but Washington reports that not much interest has been aroused there.

► Washington Water Power will move into its new $7,500,000 central service facility in the Northeast section of Spokane this month. Its former downtown office building and parking lot are being offered for sale.

► Pacific Power & Light Co. has filed a complaint with the Oregon Public Utilities commissioner charging that Springfield, Ore., municipal electric system has repeatedly and unlawfully violated its established rates and regulations in an effort to attract customers from PP&L. The action is an answer to a complaint by Oregon PUC Commissioner Howard Morgan who alleged that PP&L had made "unjust discrimination in charges for service" and had given undue preference among water and electric customers in competing with the municipal system.

PP&L stated that it has been compelled during the past eight years to meet rates of the city system and has done so legally under provisions of a PUC order of 1950. Any denial of the right to operate competitively would have "deprived the company of its property without due process of law."

► Utah cooperatives were hit by a ruling of the state's attorney-general. Limited tax assessments on power and telephone cooperatives are unconstitutional, according to the decision. The limited tax concepts, according to the official, were in violation of Utah's constitutional requirement for a uniform and equal rate of assessment and taxation. Hit under the ruling are seven power and three telephone cooperatives, all of whose property has been tax exempt with assessment limited to not more than $50 per mile of primary transmission line.

► The Pleasant Valley project may not be completely dead. Secretary of Interior Fred A. Seaton has urged the Senate to restore funds in the USBR appropriation to enable that agency to complete its investigation of the damsite. The cost of completing the study would be a "modest" $196,000.

► A Lilliputian hydro plant (600 kw) is sought by Northern Lights Inc. of Sandpoint, Idaho. The company has applied to the Federal Power Commission for a preliminary permit for a project to be located on Smith Creek in Boundary County, Idaho. The 1,900,000 kwh developed annually would be used by the company to serve present and future customers and would replace power now purchased from Bonneville Power Administration.

► Award of a $279,000 contract for electric facilities to serve the world's largest shopping center development was announced by Pacific Power & Light Co. in Portland, Ore.

Albert Bauer, PP&L assistant chief engineer and manager of construction and operations, said the Lord Electric Co. Inc., Portland, was low of five bidders on the project. The job will include construction of electric facilities to serve more than 100 shops, department stores and supermarkets in the Lloyd shopping center. The multimillion-dollar center is scheduled to be completed in the fall of 1959.

End in Sight

End of the era of great hydroelectric developments on the Columbia River system is less than a quarter of a century away, the regional chiefs of the Bonneville Power Administration and the Corps of Engineers agreed at a joint meeting of the Columbia and Missouri Interagency Committees held in East Glacier, Mont., late in June. Further large-scale hydro developments on the Columbia will become economically unfeasible by about 1975, according to Dr. William A. Pearl and Col. Allen F. Clark Jr. Pearl called for the development of upstream storage projects combined with modern thermal electric plants at strategic locations to make up for the Columbia's untimely low natural flow in the fall and winter seasons. This means of "firming up" the Columbia's hydro potential may presage entry into the thermal field by BPA. While the Columbia River has a theoretical potential of 36,000,000 kw, conflicts between the various uses of water plus economic, social and political limitations will hold the optimum development to about 50% of that figure.

► Tax assessors have been busy. In Colorado, the Colorado Tax Commission has set the taxable valuation of public utilities in that state at $383,000,000, an all-time high. Electric companies were valued at $116,000,000, rural cooperatives at $15,000,000. Public Service Co. of Colorado valuation was set at $92,000,000, an increase of more than $7,000,000 from 1957.

In Washington, valuation of Puget Sound Power & Light Co. was boosted $18,000,000 to $96,500,000; Pacific Power & Light Co. was upped $13,000,000 to $68,000,000 (properties in Washington State) and Washington Water Power Co. upper $4,000,000 to $57,000,000.

► Gerald H. Phipps has been elected vice-president and treasurer of the California Electric Power Co. He succeeds John R. Gilbert, who retired June 30 after 36 years of association with the company.

► Sam B. Chase of Butte was named senior vice-president and counsel of the Montana Power Co. by the directors following the annual stockholders' meeting in June. All other officers of the company were re-elected. Montana Power's president, J. E. "Jack" Corette, reported that the company was making investments of more than $37,000,000 in a three-year period for new plants and property.

Original "straight-through" design

This "look" on a pole means KPF

There's no mistaking the clean, pleasing pole top appearance of KPF switches—the original "straight-through" design. This design means lower cost, trouble-free service, no lubrication, virtually no maintenance. Installation may be made in the air or on the ground, on hot or dead lines, with phase units in horizontal, triangular or vertical array. Installation time is half that normally needed; no extra dead end insulators or heavy extra mounting structures are required.

Test install a KPF switch on your system this month.

KPF ELECTRIC COMPANY
Dept. W, 1624 E. Alpine Avenue
Stockton 5, California

Westinghouse Unit Subs With SHELTERFOR-M Ease Your Distribution Growing Pains

. . . SINGLE RESPONSIBILITY WITH WESTINGHOUSE UNIT SUBS

Whenever system load growth requires another substation, there's a simple solution . . . Westinghouse designs and manufactures all the components of a unit substation . . . coordinated and engineered to work together . . . complete and ready to install. Here in *one* set of specifications, *one* source, *one* contact man is the answer to your distribution problems. Quiet operation and neat, uncluttered appearance of Westinghouse substation transformers are important in making them good neighbors. Dependability, convenience of operation, ease of maintenance are the products of research and development. Some of the plus features which the Westinghouse salesman will be glad to discuss with you are Coastal Finish, Hipersil® cores, and proven impulse and short circuit design.

Shelterfor-M metal-clad switchgear provides all-weather maintenance protection for your switchgear . . . encloses common operating and drawout aisle. Eliminates front and rear doors, need for expensive concrete pads and unsightly temporary structures. The compact design saves valuable real estate.

You can be relieved of time-consuming engineering and purchasing details in building your next substation . . . and receive the counsel of Westinghouse regional application engineers and product specialists, headquarters system planners and local equipment installation and field service engineering by calling your Westinghouse sales engineer. For more information, write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-60944-R

WESTINGHOUSE UNIT SUBS MAKE GOOD NEIGHBORS

Shelterfor-M switchgear does not require concrete service and drawout pads, allowing grass and shrubbery to be planted right up to the walls. Clean, modern lines make this substation unobtrusive in residential areas.

Extensive research in the Sharon half-million-dollar sound labs has produced a substation transformer that is the leader of the industry for quiet operation. Here is a combination of pleasant appearance and quiet performance that makes Westinghouse unit subs *easy to live with*.

YOU CAN BE **SURE**...IF IT'S

Westinghouse

With Shelterfor-M switchgear, your maintenance schedule can be carried out regardless of weather — no more rainy-day delays. When necessary, emergency servicing can be done without tarpaulins or other makeshift shelters.

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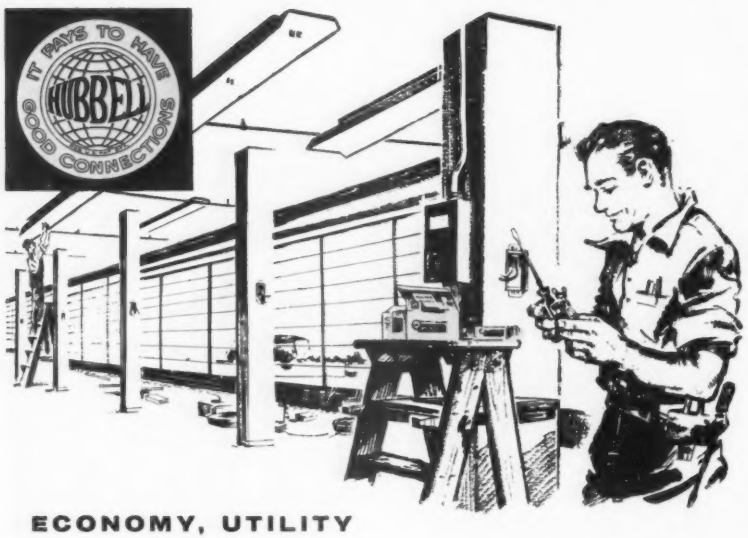


ECONOMY, UTILITY AND CONVENIENCE

NOW,— and for the life of the building!

presSwitch

CAT. NO. **1251-I**
15 amps., 120-277 volts
Single pole A.C. "PRESSWITCH"
with thru-connection

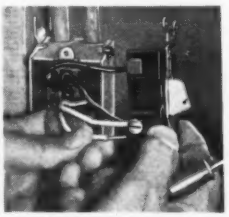
It's time for the switches . . . and "Presswitch" is your choice for smooth, dependable fluorescent lighting control. From the installation word "go", throughout the life of the building, "Presswitch" is "***quality you can put your finger on***".

"Presswitch" saves installation time, labor and materials. A thru-connection eliminates the usual ground wire splice and the time-consuming cost of making a solderless connection. Wires normally spliced are securely joined by inserting them under a screw terminal designed for the purpose. (See photo at right.)

Once installed, "Presswitch" looks as smooth as it acts. It's "on" or "off" with the slightest press of the finger or touch of the elbow, providing greater operating convenience wherever it is installed.

Ask for "Presswitch" in single pole, double pole, three-way and four-way, with ivorine or brown nylon button. It operates in any position, fits standard boxes, utilizes standard wall plates.

For Complete Information, Write



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SPEEDS AND SIMPLIFIES
WIRING, SAVES MATERIALS

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► The Federal Power Commission has authorized the merger of Southern Utah Power Co. of Cedar City, Utah, into California-Pacific Utilities Co. of San Francisco, Calif.

► Idaho Power Co. proposes to issue up to 350,000 shares of its common stock (par value $10) and to negotiate for their sale to one or more underwriters. Proceeds would be used as partial payment of outstanding short-term borrowings.

► The Federal Power Commission has approved the bid Pacific Power & Light Co. received for $20,000,000 worth of first mortgage bonds, due 1988. A joint bid of Eastman Dillon, Union Securities & Co. and Kidder, Peabody & Co. has offered to purchase the issue for a price of 99.016% of the principal amount with an interest rate of 4⅜% per year. Proceeds from the issue will be used to pay all of the company's outstanding notes at the time of the sale.

► Utah Power & Light Co. has asked the SEC and regulatory agencies in Idaho and Wyoming for authority to sell $20,000,000 worth of first mortgage bonds having a 30-year maturity date. Proceeds would go to retire an earlier bond issue and repay short term bank loans.

► The executive committee of Southern California Edison Co.'s board of directors has approved a plan to issue $50,000,000 worth of first and refunding mortgage bonds to be sold at competitive bidding. Proceeds from the issue would be used principally to help finance Edison's continuing large construction program.

► The Hawaiian Electric Co. seeks $10,000,000 in new capital to finance 1958 capital improvements. An application for the approval to issue 42,350 shares of common stock and 225,000 shares of cumulative preferred stock has been filed. Subject to regulatory sanction, the company plans to offer the new common on a rights' basis to present stockholders and to sell preferred stock either through underwriters or at a private sale.

► The Baranof Island hydroelectric project, to be built by the city of Sitka, Alaska, has been licensed by the Federal Power Commission. The proposed project, costing nearly $5,000,000, will consist of hydraulic and electrical facilities capable of producing 6,000 kw.

No. 8 in a series

Right off the Wire

About half of this country has been converted to dial telephones and it is expected that within five or ten years, it will be possible to dial Europe or the Hawaiian Islands.

&

Two new developments in "fiber optics" (the use of glass or plastic fibers to transmit light around curves) are in the examination of the inside of the human body and in cryptography.

&

A new plastic reinforced with silica withstands high temperature better than steel.

&

A new technique in the use of radar antennas which involves sweeping the beam will give them a range of 3,000 miles without increasing their size.

&

Simplex researchers, D. W. Kitchin and O. S. Pratt, have developed techniques for taking photomicrograph movies of polyethylene insulation failures caused by excessively-high voltages.

&

A thermo-electric engine, based on the temperature differential between dissimilar metal plates, converts atomic energy directly into electricity with a thermal efficiency of twelve per cent.

&

A new machine uses the light from atoms of mercury to control the engraving of lines on diffraction gratings which must be less than a wave length of light apart. Accuracy is closer than one-millionth of an inch.

&

The strength of cast iron and resistance to high temperature are combined with good electrical resistance in a new ceramic.

By using a clock based on the vibration of an atom of cesium, it has been found that the length of our day has been increasing half a thousandth of a second per year.

&

A new television picture tube has a front of double glass with mineral oil between. This increases light transmission by reducing reflection.

&

A two-volt booster battery is made to supplement a regular automobile battery. It is used only in starting.

&

Simplex ANHYDREX XX insulation has greater resistance to deterioration at elevated operating temperatures than any natural rubber of GR-S heat resisting insulation.

&

A ramjet power plant for permanent earth satellites has been designed which would obtain its power from the re-combination of oxygen atoms that have been divided by cosmic radiation in the higher altitudes.

&

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

&

An electron tube the size of a shirt button is made of layers of titanium and ceramic. It makes the tube competitive in size with the transistor.

&

An instrument for detecting radiation is said to be so sensitive that it can detect a thousandth of a gram of chromium 51 dissolved in a river.

&

A patent has been issued for a television set that shows two programs superimposed on one screen. The images are separated by polarizing glasses and individual earphones reproduce the sound.

A treatment for metal bearings is claimed to make it possible to run them indefinitely without lubrication. It has also been tested on power press tools.

&

A three-dimensional cathode-ray tube gives a display with a depth of one mile.

&

A steel roller for a new paper mill is said to be the largest in the world. It is over twenty-six feet long and is forty-four inches in diameter.

Submarine cables for railroad use!

Submarine cable is required by the New Haven R.R. for the power and control of 24 movable spans at 14 railroad bridges. Old style steel armored cable suffered the ravages of salt corrosion, strong currents and constant flexing, all of which resulted in high maintenance. Replacements, as required, are made with new Simplex submarine cable, jacketed in fabric-reinforced neoprene — a product of Simplex research — a remedy for delayed service and high maintenance costs.

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Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

"The American manufacturers of transoceanic telephone cables"

Association Affairs

NAED—In copying a news release from NAED which was in error we also erred in listing the company connection of H. F. Boeger, who is secretary-treasurer of State Electric Supply Co. in Oakland. He was elected a member of the board of governors of NAED at the recent San Francisco convention.

MISUNDERSTANDING might result from the too-brief report we made of Portland code requirements regarding mounting of fluorescent fixtures on low density cellulose material, Joe F. Gray, chief electrical inspector, responds. The report was made at an Oregon Chapter, IAEI, meeting. To clarify, Portland requires spacing of 1½-in. from such material for fixtures otherwise approved for mounting on combustible material, unless especially approved for the purpose. Spacing of ½-in. is required from the butting of such material against a fixture mounted on some other type of surface.

IAEI—Rocky Mountain Chapter, International Association of Electrical Inspectors, elected Charles K. Carter, Boulder, as its chairman; William F. Stultz, Canon City, Southern Colorado Power Co., vice-chairman; Henry H. Blattel, Aurora, second vice-chairman; D. G. Mulliagan, Mountain States Inspection Bureau, re-elected secretary-treasurer. Next meeting will be held in mid-September. At the annual meeting Herbert J. Williams, Colorado Central Power Co., talked on the desirability of the three-wire perimeter interior wiring system. Code panel members were Herb Smith of the same company, Howard G. Pease, Limon, Don Murtaugh and Henry Blattel.

Calendar of Meetings, Fall of 1958

August

6- 8—**American Institute of Electrical Engineers,** nonlinear magnetic conference, Statler Hotel, Los Angeles, Calif.

13-15—**Institute of Radio Engineers,** conference on electronic standards and measurements, NBS Boulder Laboratories, Boulder, Colo.

19-22—**AIEE,** Pacific general meeting, Senator Hotel, Sacramento, Calif.

19-22—**Western Electronics** show and convention, Pan Pacific Auditorium for show, Ambassador Hotel for convention, Los Angeles.

September

10-12—**Northwest Public Power Assn.,** Power Use Section, annual meeting, Malaspina Hotel, Nanaimo, B. C.

14-17—**Rocky Mountain Electrical League,** fall convention, Jackson Lake Lodge, Moran, Wyo.

15-17—**International Association of Electrical Inspectors,** Northwestern Section, annual meeting, Northern Hotel, Billings, Mont.

17-19—**Northwest Electric Light & Power Assn.,** annual meeting, Sun Valley Lodge, Idaho.

19-20—**National Industrial Service Assn.,** Rocky Mountain and Utah Chapter joint meeting, Aspen, Colo.

22-24—**IAEI,** Southwestern Section, annual meeting, Disneyland, Anaheim, Calif.

25—**Bureau of Home Appliances** of San Diego County, fall conference, San Diego, Calif.

October

10—**NISA,** Northwest conference, Portland, Ore.

November

17-20—**National Association of Railroad and Utilities Commissioners,** annual convention, Westward Ho Hotel, Phoenix, Ariz.

19-20—**Pacific Coast Electrical Assn.,** Administration Services Section, Hotel Claremont, Berkeley, Calif.

29-Dec. 3—**Bureau of Home Appliances of San Diego County,** annual exposition, Balboa Park.

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San Diego:	720 State St. BELMONT 3-1361
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Santa Ana:	301 French St. KIMBERLY 3-8309
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Colorado Springs:	630 West Vermijo Ave. MELROSE 4-3701
Denver:	104 Wazee Market TABOR 5-7111
IDAHO	
Boise:	1325 Idaho St. BOISE 2-4501
MONTANA	
Butte:	604 E. Aluminum St. BUTTE 3222
OREGON	
Eugene:	2580 West Broadway DIAMOND 4-2224
Portland:	Park & Flanders Sts. CAPITOL 7-6641
UTAH	
Salt Lake City:	2336 North Third West St. ELGIN 9-8771
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Tacoma:	2112 "A" St. MARKET 0164

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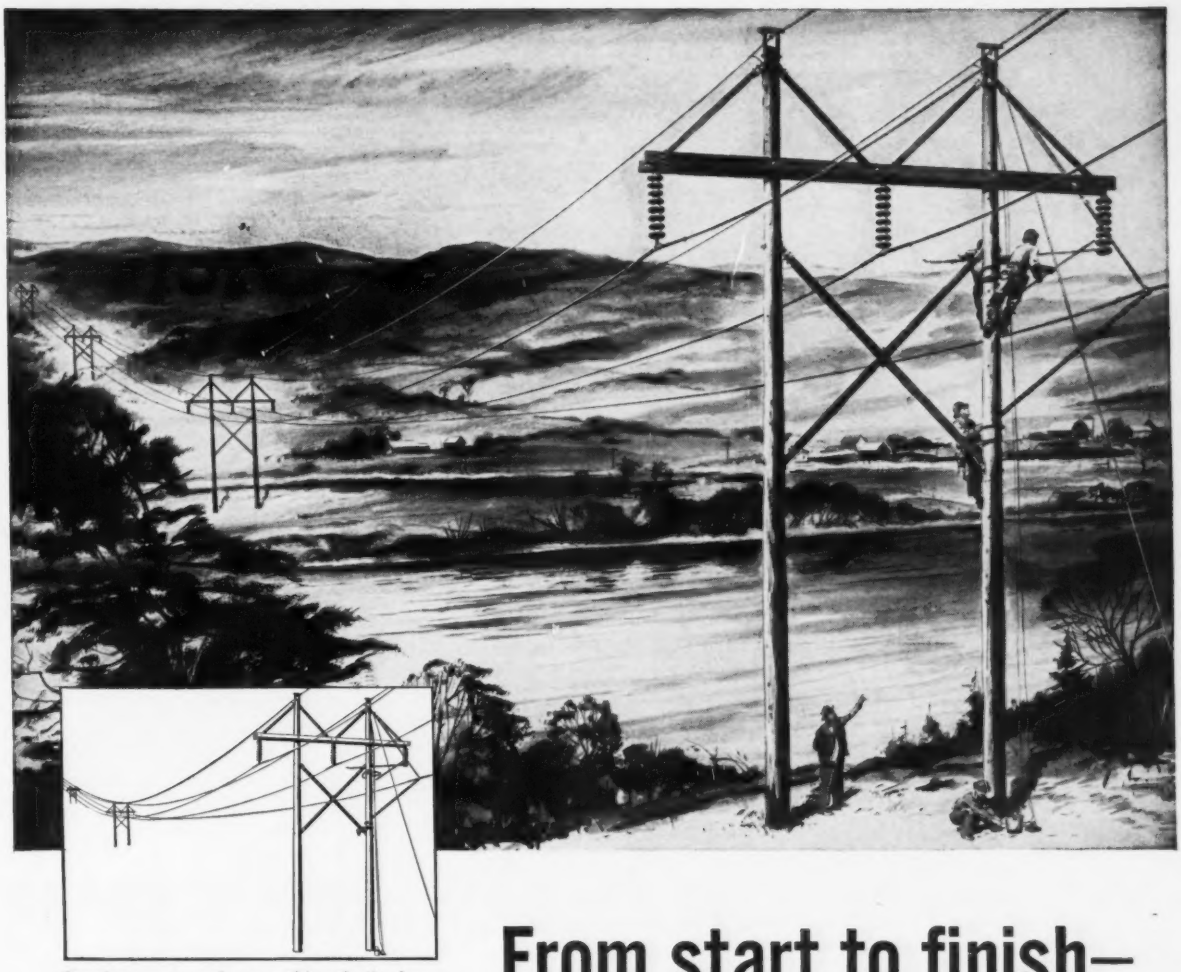

Graybar can supply everything that's shown above — except linemen and scenery — for line construction *and* maintenance. Poles, crossarms, hardware, tools—a partial list of items that are stocked at strategic Graybar locations throughout the country. All available for fast delivery to you. It pays to call Graybar . . . *first.*

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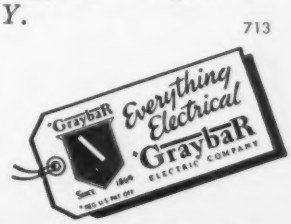


GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK, IN OVER 130 PRINCIPAL CITIES

Market Development

Retirement Party

More than 200 friends and associates, including representatives of the organizations she has served during 20 years with Pacific Gas and Electric Co., honored Cleo Filsinger at her retirement dinner on June 26. Music by a PG and E group, presentation of gifts and good fellowship made for a pleasant evening but the highlight came with Mrs. Filsinger's reminiscences.

Succeeding her as San Francisco division home economist is Evalyn Vaughan, whose former post in the general office home economics staff has been taken over by Janet McNair, who recently came to PG and E from Washington Water Power Co. Mrs. Vaughan has been with the company 11 years, before that was with WWP.

W. L. Greer, San Francisco division manager, PG and E, gives Cleo Filsinger gifts from her many friends. Cake is a reminder of Cleo's avocation—designing her own hats

What's Cooking

A summer cooking school for teenagers is being conducted by Hawaiian Electric Co.'s home service department. With an overflow group at the first session in June, classes were added to the July and August schedule.

What's Cooking in Teentown is the program name, chosen in a contest at the first session. Simple dishes that youngsters can cook at home are prepared and given as prizes at the end of the class.

Tuesday Record

Four-month accomplishments were checked and future plans laid for Electrical Tuesday at a recent meeting called by Montana Power Co. in Butte. Attending were appliance manufacturers, distributors and others in the industry as well as advertising agency and newspaper men in Montana and Washington.

In inviting industry members to participate, D. J. McGonigle, Montana Power general sales manager, called for a "good hard look" at the record and frank discussion before the program is resumed in September after a two-month vacation.

During the first four months of the concerted Tuesday promotion 791 newspaper ads appeared in the four major markets of the state, totaling 31,333 inches. Combined circulation is 1,519,164.

Bright prospects for Montana's future were told by Colin W. Raff, Montana Power Co. vice-president. Spring rains improved the outlook for agriculture and livestock, he said, and lumbering is showing good strength, with most markets in western Montana operating at 1957 levels and some at levels equal to 1956. Housing permits for the first quarter totaled 489, 50% above those issued in the same period of 1957, Raff said. He also mentioned the spectacular climb of the oil industry.

► Give Better Electrically will be the main theme of the **Edison Electric Institute's housewares promotion kit** for use by utilities and retailers this fall. Secondary theme will be Electric Gifts Keep on Giving.

► A **flat rate for wiring** may be established in connection with the fall electric range campaign being coordinated by the Los Angeles Electric League. A finance plan also is being studied by the Department of Water & Power. In an earlier campaign where interest was shown by contractors in establishing a flat rate for wiring, it was believed that lack of an accompanying finance plan slowed sales.

► **Gray Distributing Co.** in Honolulu has set up an appliance servicing department that offers repairs both in the home or the shop on all brands. Round-the-clock service includes painting, delivery and installation. Eight appliance mechanics and four trucks have been added.

► Public interest in the **Medallion Home** program is reflected in the name of a new development in southern California—**Medallion Park.** Raznick and Sons are putting up 46 Medallion homes in Granada Hills with 200-amp dual-service panels. A Gold Medallion model home was shown by this builder at the recent Los Angeles Home Show.

You Auto Buy a Washer

Nides, Denver appliance dealer, promoted its third annual automatic washer sale by giving away 1949, 1950 and 1951 model automobiles with each purchase.

The purchasers had the choice, too, of turning in the automobile on a 1958 Plymouth. The new and used car dealer who supplied the old models to Nides offered to allow $500 trade-in on the free car in the purchase of a 1958 car.

Thirty-one washers were sold the first day of the car giveaway. The buyers received their cars entirely free with the sales tax, title fee, brake and light certificate paid.

Heinrich

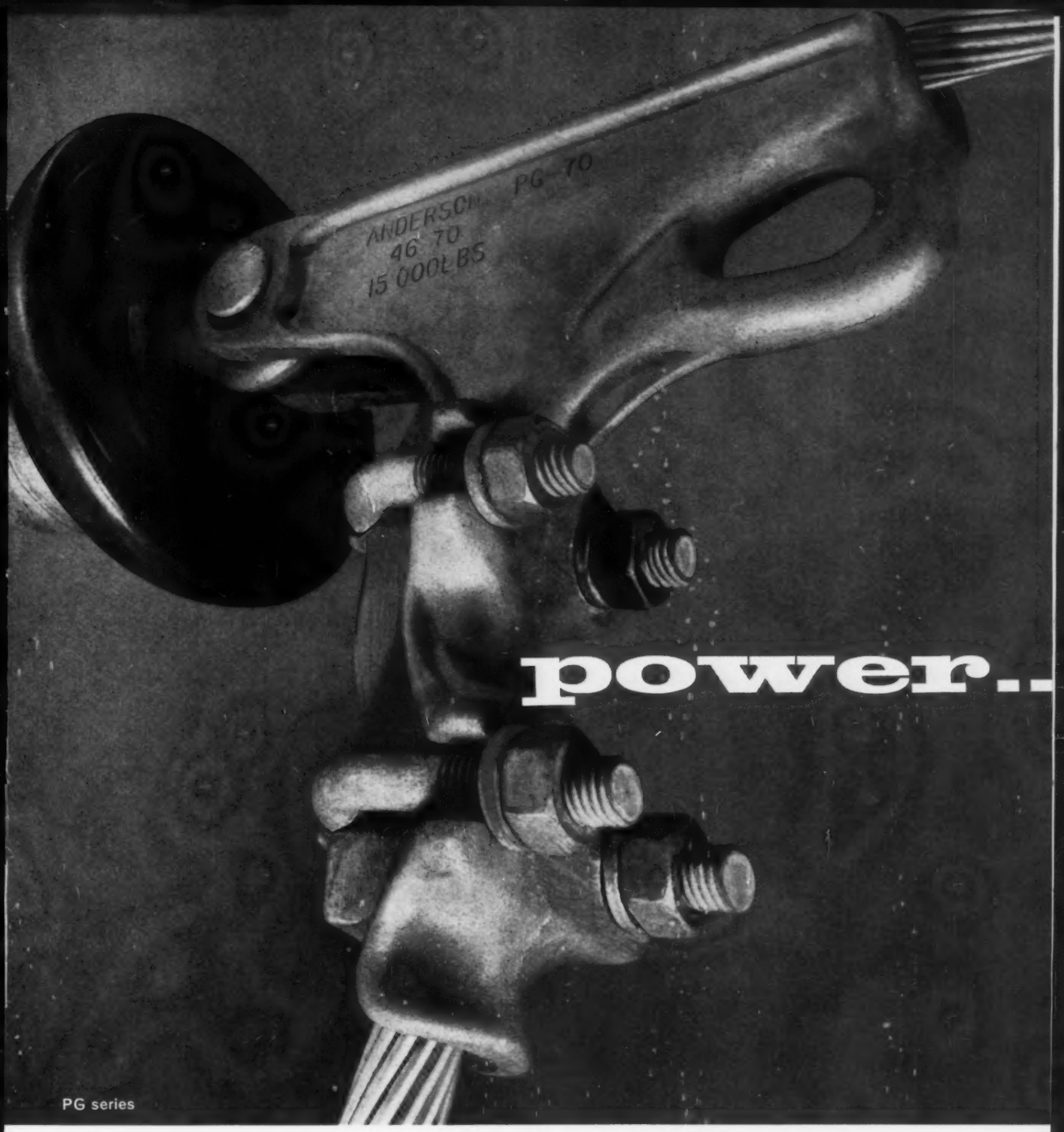
Field

Harry Field Retires

Herbert Heinrich has been named manager of Hawaiian Electric Co.'s commercial department, succeeding Harry P. Field, who retires in September after 32 years of service.

Field, a HECO vice-president since 1947, has many friends on the mainland and has been active in PCEA. He joined the company in 1926 as an appliance sales supervisor and later was assistant to the general manager. He is a graduate of MIT.

Heinrich was with Westinghouse and Dollar Lines before he joined HECO in 1936. He has been in engineering and construction department posts; was manager of the distribution department when he was transferred to the commercial department in February as Field's understudy.



power..

PG series

ANDERSON ELECTRIC

Anderson's Pistol Grip aluminum dead end clamps give top performance on distribution and sub-transmission systems. Snub Seat design assures high holding power. Strong, lightweight aluminum construction reduces cable damage, and one-piece keeper assembly speeds installation.

ANDERSON ELECTRIC CORPORATION
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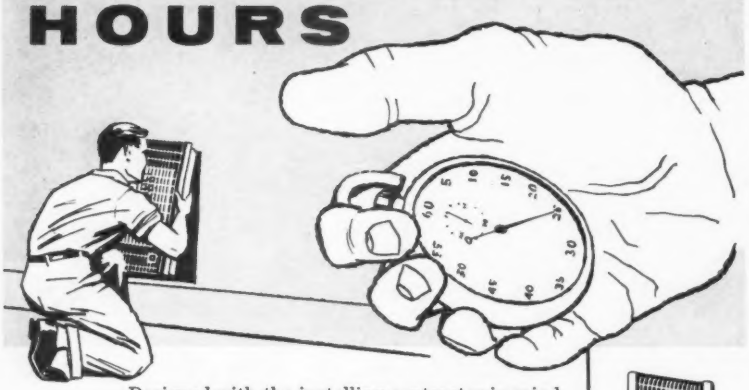
Export Representative: International Standard Electric Corp.

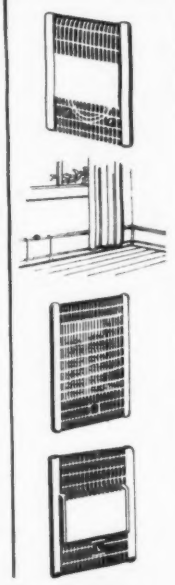
Aluminum & Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATION • TRANSMISSION • DISTRIBUTION

WESIX SAVES Installation HOURS



Designed with the installing contractor in mind as well as the perfect comfort of the home owner, WESIX Wiredheat units save real money all through the job. Here are just a few features which can cut HOURS from job time, hours that might otherwise EAT UP PROFITS:

- **REMOVABLE TERMINAL ENCLOSURE.** On all WESIX Wall Furnaces and Convectors, this exclusive feature makes connections twice as easy, makes for a neater job.
- **PRESSURE CONTACTS.** On WESIX Monofin Baseboard you wire only to the raceway plate. Heating sections are automatically connected by contact terminals when they are fitted in place.
- **DROP-IN PLUG** on WESIX Floor Convectors mean quick and easy installing as well as safe and easy cleaning for customer.
- **CONVENIENT KNOCK-OUTS** on all WESIX units are placed just where you need them . . . AND they break out quick and clean.
- **RUGGED CONSTRUCTION** of all components minimizes damage on the job and in transportation . . . eliminates hours spent in repairing and refitting parts.



These are just a few of the reasons why contractors prefer to install WESIX Automatic Electric Heating equipment... products that show the results of *more than 35 years of WESIX leadership* in electric home heating.

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Learn how WESIX can help you to more profits in modern electric heating. Call your local Wesix representative or write today to:

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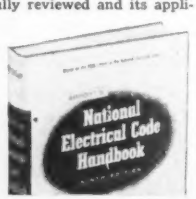
Here is the electrical contractor's job book, **completely revised** to conform with the 1956 Code requirements—designed to help you understand and do work in accordance with the National Electrical Code. In this handbook you will find explanations of rules and measurements for the various types of jobs—what they mean—how to apply them. Wherever a ruling lacks clarity, it is carefully reviewed and its application explained. Diagrams, sketches, and illustrations used freely. 9th Ed. Revised by C. L. Smith. 642 pp., 394 illus., 34 tables, $8.00.



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First Gold Medallion For Colorado

Colorado's first Gold Medallion house, in Pueblo, was certified recently by Southern Colorado Power Co. and attracted some 8,000 visitors during a one-week showing. Pueblo Homes was builder; Coleman Electric, electrical contractor.

The power company hands out a comprehensive folder to open-house visitors, including floor plan, with features numbered for easy identification for the full housepower model. Details were given on the electric heating, which attracted a good deal of attention. More than 19,000 cu ft of space are heated with baseboard radiant glass panels.

According to E. H. Pemberton, general sales manager, the folder provides a program for the visitors, most of whom fill out the accompanying registration card qualifying them for door prize drawings.

Indications are that several builders of both custom- and project-type homes are going along with Colorado Power on the Medallion program, Pemberton said. Right now an old home in the Cripple Creek mining area is being remodeled to Gold Medallion standards. Fact that the owner wants to keep 1890 traditional features and decor while adding the benefits of electrical living will present interesting design problems to lighting engineers.

Sales People in the News

► Thermador has promoted **Anthony A. Celio** from advertising manager to sales manager, Los Angeles district. **Richard F. Gamble,** formerly assistant advertising manager, will take over the duties of advertising manager for Thermador at Los Angeles and the A. J. Lindemann and Hoverson Co. of Milwaukee.

► **P. V. Key,** until recently district manager of the Kelvinator Division of American Motors, has entered the retail field under the name of Kalocks Inc., with a store at 410 Elliott Ave. W. on Seattle's waterfront. The company initially handles the full Kelvinator line and also the Philco-Bendix line of TV and laundry appliances.

► **Ralph O. Bradley** has been named sales manager of the Salt Lake City district of Westinghouse appliance sales. He replaces **J. A. Marine,** who becomes sales supervisor in Boise.

This spoutless coffee maker was one of several new Westinghouse portable models introduced last month. Suggested retail price is $17.75. Shown at the same time was a group of five appliances that operate from a single control and can be immersed completely for cleaning. A Dutch oven, two fry pans, sauce pan and griddle are included in this Immerse-A-Matic line

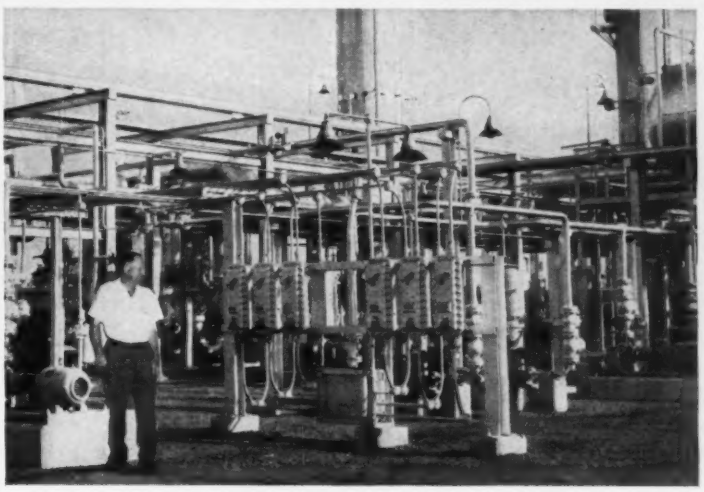
Products

Westinghouse is demonstrating appliance models that both cool and heat, without motors or compressors. The two experimental devices, using new semiconductor materials, are a battery-operated hostess cart that refrigerates in one compartment and cools in another, and a baby bottle warmer and cooler with an automatic timer. Estimated prices are respectively $300 and $50. Absence of moving parts cuts down on bulk, eliminates noise and vibration. D-c is required, 60 w for the bottle warmer and 150 w for the cart. Westinghouse is using the models to dramatize the break-through in thermoelectric research, according to Chris J. Witting, consumer products vice-president.

Packard Bell introduced its 1959 line to 43 distributors in the 11 Western states at a two-day convention at the Statler Hotel in Los Angeles. The black and white series includes 14 TV receivers, five with stereophonic sound. Three TV models reproduce full color.

Introduced to Western distributors in a one-day convention in San Francisco, **Motorola's** 1959 line of TV, radio and hi-fi features stereophonic sound and cabinet design by Drexel. Shown on the stage in a presentation that was professional and fast moving, the models were assembled for closer examination at the end of the session. Motorola President Robert W. Galvin headed the factory group that came West for the showing.

EASILY INSTALLED NELSON STARTERS SAVE FIELD TIME



A few of the many Nelson explosion-proof, combination starters used in the Sunray Mid-Continent natural gas plant at Redfish Bay, Texas.

Nelson explosion-proof combination starters are designed and built with the field man in mind. The starter comes fully assembled and wired, ready for quick easy installation.

If the cable pulling job is difficult only a few minutes are required to remove the four screws holding the pan mounted assembly. This leaves the whole enclosure available for cable pulling.

Nelson selects and uses only those components recognized for reliable trouble free performance, thus reducing maintenance to a minimum.

For Class I, Group D hazardous locations Nelson combination starters offer you the very best in safety, low installation cost, and minimum maintenance.

For more information on Nelson Combination Motor Starters write for Bulletins 420 and 1026.

OUR 20th YEAR

a major source of electrical control equipment for industry

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

Sponsored jointly by Seattle City Light and Crescent Mfg. Co., this exhibit won a silver award as one of the three best booths at the annual Pacific Northwest Restaurant Convention and Exposition in Seattle. Visitors were shown how to make a profit on a cup of coffee; were served sweet rolls baked on the spot in electric ovens. City Light commercial consultants, John G. Benson and Phil Schaeffer, designed the booth; Mary Norrise and Janice Wagner, City Light home economists, and Peggy Taufen of the utility's service department were hostesses. Six other City Light booths told advantages of electric cooking and water heating and effective lighting

Area Development

► Two new industries in the eastern Oregon territory of California-Pacific Utilities Co. were announced recently. An AAF Radar facility will have a technical center and personnel headquarters in Baker, and an operations center on Beaver Mountain 10 miles south of the city.

► Chemical Lime Products Co. of Oregon is the name of a new operation set up to mine extensive deposits of almost chemically pure lime near Baker, and reduce it to forms and packages used in various chemical processes.

Summer Campaigns

Here are some of the summer promotions reported by utility sales departments:

• Red Tag appliance clearance sales started July 16 in Washington Water Power territory, sponsored by Inland Empire Electrical League. Hard-sell league ads (including color for Spokane dailies) will run through Aug. 16. Dealers may put red tags on any merchandise they choose; add sales impact with tie-in advertising.

• Pacific Gas and Electric Co. is urging dealers to combine the NCEB July 1-Aug. 16 refrigerator-freezer promotion with a well-organized "Better Buy—Now!" effort. The program includes a salesman's incentive program offering local promotions and contests, with tape recorders as prizes. Better Buy—Now meetings continue on the PG and E system.

• Franklin and Benton County (Wash.) PUDs are running an advertising campaign to direct traffic to Medallion Homes in the area.

• "Even purple people eaters buy electric freezers!" said Pacific Power & Light Co. in introducing its three-month freezer campaign to dealers through **Current Plugs**.

Farm Groups Promote

The Colorado Farm Power Council and Colorado Rural Electric Assn. have joined in a series of promotions to spur electric appliance sales. "Now is not the time to sit on our pocketbooks," said Glenn Stukey, president of the Colorado Farm Power Council, in kicking off the program.

Stukey, manager of the Yampa Valley Electric Assn., said the many special promotions include liberal trade-ins on old gas stoves for modern electric ranges, free installation and special cash discounts.

Emphasis is being placed by the council on Better Light, Better Sight farm and home lighting promotions in September. Electric heating is on the October promotion calendar.

Growth

West's Largest Unit

The largest electric generating unit in the West recently went into operation as Southern California Edison energized the first 200,000-kw unit at its new Huntington Beach steam station. Cost of the first two units at the Huntington station will total $58,000,000. The new turbines are of the axial flow design, which permits steam to move in a continuous horizontal path without the usual downward right angle turns. The units are of the "cross compound" arrangement. The station boasts throttle pressures of 2,400 psi and initial temperatures of 1,050 F—the highest pressure and temperature presently used in any steam station west of Chicago.

Edison has on order a once-through universal pressure boiler, which it is assumed will be installed for the additional two units at the company's Huntington Beach station. The once-through boiler is different from conventional boilers in that it has no steam drum. Forced circulation allows the water that enters at one end to emerge from the tubing as steam without the necessity of being flashed off a drum. The new boiler will operate at close to critical pressure, permitting greater cycle efficiency than in conventional boilers.

Atom Contracts Boom

The AEC's Idaho Operations Office has announced plans for construction of a 20,000-kw (electrical) nuclear power plant, utilizing an experimental breeder reactor, at the Arco, Idaho, test station. Work on the EBR-II facility will cost an estimated $3,000,000, including construction of the power plant and cooling tower and completion of the reactor plant building. The successful bidder will install $2,000,000 worth of government furnished equipment. EBR-II will be an unmoderated and liquid metal-cooled reactor with a thermal output of 62,500 kw—20,000 kw electrical. The facility will be operated for the AEC by the Argonne National Laboratory, and will employ full size components in a sodium coolant system.

At the same time, the AEC has issued an invitation to U. S. industrial firms to submit proposals for operating Argonne's Low Power Reactor.

NEVER OVERLOOK THE DANGER OF EXPLOSIVE DUST...

Some of the most disastrous explosions in industrial history occurred through the ignition of dust suspended in plant atmosphere—some of them dusts which were thought to be perfectly harmless. *Until they exploded.*

The moral is clear: If you can see quantities of dust in your plant, *it's dangerous.*

Crouse-Hinds dust-tight* Condulet equipment seals off electrical sparks and prevents ignition of air-suspended dusts. It is designed to minimize the accumulation of dust on outer surfaces. As an added precaution, it is built to operate at a temperature below dust-ignition points *even when blanketed with dust.*

The new Crouse-Hinds "Hazard Finder" will help locate the hidden probabilities of electrically-ignited explosions in your plant. It reflects, in non-technical language, the latest findings of the National Fire Prevention Association for thorough control of electrical explosion hazards. Just clip coupon below.

*Dust-ignition-proof.

Crouse-Hinds Dust-tight Lighting Fixture

Crouse-Hinds Dust-tight Panelboard

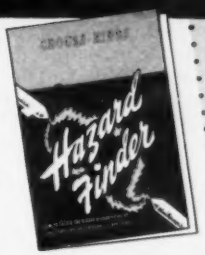
● CONDULET® ELECTRICAL EQUIPMENT — More than 15,000 items in dust-tight, explosion-proof or conventional construction including rigid conduit fittings, lighting fixtures, switches, plugs and receptacles, motor controls, pilot lights, push-button stations, and other process control components.

CROUSE-HINDS COMPANY
SYRACUSE 1, N. Y.

Crouse-Hinds products are sold exclusively through electrical distributors.

Send coupon today for handy new HAZARD FINDER!

Contains 13 check questions to which every management team should know the answers! Each answer evaluated in accordance with National Electrical Code requirements.



CROUSE-HINDS COMPANY
1205 Wolf St., Syracuse 1, N. Y.

Send me your Hazard Finder.

Name_____
Position_____
Company_____
City_____
Zone_____ State_____

Manufacturers—Distributors

Executive Changes

Allis-Chalmers has set up a new position, director of sales promotion, with Charles W. Parker Jr. in charge. Included in the new organization are a publications and industrial press department, headed by A. R. Tofte, and an advertising department under J. W. Murphy. Tofte was manager and Murphy was assistant manager of the former advertising and industrial press department.

Frank H. Roby, formerly Square D vice-president, has been appointed executive vice-president of Federal Pacific Electric Co.

General Electric has appointed J. W. Belanger as general manager of its Apparatus Sales Division, succeeding the late William V. O'Brien.

S. M. Pearl was named sales manager of Circle Wire & Cable Corp.

► **Westinghouse** Electric Corp. has transferred responsibility for manufacturing and marketing of electric heating equipment from Sunnyvale, Calif., to its Air Conditioning Division plant at Staunton, Va.

► **Dymec** Inc. is the new name of Dynac Inc. of Palo Alto, Calif. Change was made because of conflict with a previously registered trademark of another company. Dymec makes automatic test equipment and special purpose electronic instruments.

► A new 86-in. hot strip mill at **Kaiser Steel** Corp.'s Fontana, Calif., plant was started up last month. The mill is a part of the company's current $214,000,000 expansion program.

► **I-T-E Circuit Breaker** Co. has acquired all outstanding capital stock of **Canadian Porcelain** Co. of Hamilton, Ontario.

► **Magnes Co. Inc.,** San Francisco, has taken over all assets and operations of the former **Robert R. Prussia** and **Magnes** companies. Its warehouse at 355 Eighth St. is in charge of Dan Griffin. George Magnes, Ken Slocum, Don Morrison and Bill Maguire are covering the outside territory; Larry Driscoll is inside salesman and office manager. The company handles cable, fittings, boxes and other electrical devices, as well as signalling equipment and fluorescent starters.

► Despite the fire that swept its Los Angeles plant last spring, **Zinsco Electrical Products** Corp. is now employing 90% of its workers. The company has been able to maintain deliveries of switchboard and switchgear even though one of its major fabrication facilities was damaged. Immediately after the fire it leased warehouse facilities and converted them into fabrication buildings. Molds and dies were salvaged and placed in hands of outside fabricators for production of certain components. Assembly facilities, which escaped damage, were at full capacity within one day.

► **General Electric** Co. has announced that irradiation space and experimental facilities in the 30,000-tkw test reactor it is building at its Vallecitos, Calif., atomic laboratory will be made available to industrial, educational and research organizations. J. Emmett Maider, manager of marketing and project operation for G-E's atomic power equipment department at San Jose, made the announcement. The test reactor is slated for completion this fall.

► **U. S. Relay** Co. has moved into a new 30,000-sq-ft headquarters facility in Azusa, Calif. The new plant will permit expanded production of electrical relay switches and, along with it, an expansion of the firm's sales and engineering departments.

► **Sam Rowland,** formerly with General Electric Appliance Division, has joined California Electric Service, Los Angeles, as field service representative for its five southern California branches. He succeeds the late George Newlin.

► **Ralph B. Black** has been named sales representative for Automatic Switch Co. in New Mexico and west Texas. His headquarters are at 721 Loma Vista Drive, N. E., Albuquerque.

► **Leonard L. Minthorne** Co., Portland, has moved into its new building at 0673 S. W. Taylors Ferry Road. The firm represents Continental Carbon Inc. and Alpha Wire.

► **Kim Lighting & Mfg.** Co., El Monte, Calif., will move early this summer to a new 14,200-sq-ft headquarters in Pasadena. The firm specializes in garden and swimming pool lighting.

Howard Arnett, Portland General Electric Co. vice-president (right), and Earle Williams, vice-president for marketing, Line Materials Industries, discuss the world's first self-regulating distribution transformer at L-M's Chicago preview for utility executives and industrial editors. First West Coast SRT installations will be made soon in a program of nation-wide distribution for field testing

► **William J. Cottrell & Associates,** 400 S. W. Macadam, Portland, has been named representative for Oregon, Washington and Idaho for Ripley Co. Inc., Metaltown, Conn., manufacturer of sun switches for street lighting systems. **W. R. Henrey** Co., Seattle, will handle the line for Cottrell in the Puget Sound area.

► **Lynne Stanley** resigned from the Emerson-Pryne Co. June 1 to return to his own **Stanley Sales Corp.,** which moved into a new building at 1122 Folsom St., San Francisco, where larger display, office and warehouse space is available. The lines represented by Stanley Sales Corp. include the Miller Co., Kirlin, Stoneco, Sierra, Nu-Art, Stevens, Touchplate.

► **Cal-State Electric Supply** Co. at Lancaster sold out to Electric Corp. of Los Angeles recently and **William Stewart,** who was one of the partners, has returned to **Smoot-Holman** Co., Inglewood.

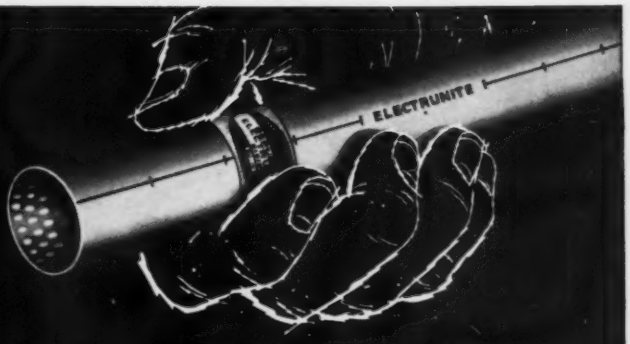
► **William S. Herdon** was appointed Day-Brite sales representative in the Los Angeles sales office of **Day-Brite Lighting** Inc. at 111 N. La Cienaga Blvd., Beverly Hills. He holds an EE degree from University of Pennsylvania.

► **Industrial Engineering & Equipment** Corp. has moved its Los Angeles office to 2975 Wilshire Blvd.

more contractors use Republic ELECTRUNITE E. M.T. because...

THE BEST COSTS LESS INSTALLED

Apartment Building: Carlton Plaza, Kansas City, Missouri
Architect: Herbert E. Duncan, Kansas City, Missouri
Electrical Contractor: Twin City Electric Company Kansas City, Missouri



Department Store: Wm. Taylor Son & Company, Cleveland, Ohio
Architect: Welton Becket, F.A.I.A. and Associates, Los Angeles, California

Junior-Senior High School: Hampton Township School District, Allegheny County, Pennsylvania
Architect: Celli-Flynn, McKeespart, Pennsylvania
General Contractor: Perry J. Dick, Inc., Large, Pennsylvania
Electrical Contractor: Rena Electric Company, Pittsburgh, Pennsylvania

In all types of construction—Republic ELECTRUNITE® E.M.T. provides installation economies that help you make a profit on the job.

Bending quality is built-in! Republic ELECTRUNITE E.M.T. is manufactured by one integrated producer. It is made from highest quality new billet flat-rolled steel. Ductility is protected throughout all manufacturing processes from ore to finished product.

Other installation economies are built-in, such as exclusive "INSIDE-KNURLING", the "ball bearing like" surface that reduces friction — makes wire pulling as much as 30% easier.

Only Republic ELECTRUNITE E.M.T. is "INCH-MARKED"® in feet and inches on all sizes up to 1¼" for fast, accurate measuring. And Republic ELECTRUNITE E.M.T. is "GUIDE-LINED" from end-to-end to keep bends in line, avoid "wows", and eliminate wasted time and wasted materials.

ELECTRUNITE E.M.T. meets Underwriters' Laboratories Standards, Federal Specification WW-T-806 (latest revisions), A.S.A. Specification C.80.3.

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B-M THE ORIGINAL INDENTER FITTINGS

Over 25 Years of Proven Performance

Permanent locked-in bushing insures smooth burr-free raceway for easy fishing. No extra work.

BRIEGEL RED THROAT

1. Protruding rounded red plastic lip of bushing prevents cutting of insulation—eliminates shorts.
2. Full thread screws into all conduit fittings. Lip of RED THROAT bushing protects thread from damage.
3. Deep dished eight pronged lock nut is easier to drive on—screws flush to shoulder and digs into metal of box for vibration proof positive ground.
4. Two quick squeezes with The Briegel Indenter and BM All Steel Indenter Fittings are set forever. Metal is pressed into metal for permanent installation and positive ground.

NEW POCKET SIZE INDENTERS

Just 10" long, these new patented compound leverage indenters are only plier size. Lighter to carry and easier to use—the leverage does the work. No. 607 for ½" and No. 608 for ¾" fittings.

BRIEGEL METHOD TOOL COMPANY

GALVA, ILLINOIS

All B-M Indenter Fittings are U.L. Approved as concrete-tight and for general use (File Card E10863). Also comply With Federal Specifications W-F-406.

ALL BRIEGEL FITTINGS ARE U. L. APPROVED AS CONCRETE-TIGHT

► Hunter Division of Robbins & Meyers Inc. of Memphis, Tenn., supplier of ventilating equipment since 1878, has entered the electric heat field. The company will continue to manufacture its line of industrial and residential ventilating fans. F. S. Brady, vice-president, said the firm will market electric space heaters, recessed wall, baseboard and bathroom heaters. He predicted that by 1960 more than one million homes will be heated electrically.

► **The Stusser Electric** Co., with headquarters at Seattle, opened its third branch operation in July at Bellevue, with **James Jacques** as manager. The company's other branches are in Yakima and Mount Vernon.

► **M. Levin,** Portland manufacturer's representative for Eagle Electric Mfg. Co., and Berns Mfg. Corp., has moved headquarters to 205 N. W. 10th Ave., closer to the nucleus of the electrical trade than his former office at 2331 S. W. First Ave. The new location affords 7,000 sq ft of warehouse space.

► **James L. Kearns** Co., Portland representative for a number of controls and instrument manufacturers, has added 800 sq ft of showroom space to the new offices it opened last fall at 6055 N. E. Glisan St.

► Two new additions have been made to the sales staff of **Pacific Electric Sales Co.** Glen M. Donley has joined the firm to cover the Spokane trading area and Dave E. Erickson will have the Seattle territory. The additions were made to give better coverage for the firm's lines, particularly for Markel electric baseboard.

► **Jim Caldwell** has joined J. A. Tudor & Associates Inc., Portland, as a sales engineer, contacting industrial and utility customers in the firm's service area.

► **Wayne C. Wells,** Portland representative for Midwest Electrical Products Inc. and Linemaster Switch Corp., has found the trailerhouse field is one in which there is apparently no recession but says he is amazed at the electrical demands of these "palaces on wheels." Some of them now require 100-amp service.

► **Western Electric** has opened the largest of its 32 supply plants with a new $5,000,000 building on a 22-acre site at 2400 Yates Ave., Los Angeles. More than 5,000 employees and their friends filed through the facility during a four-day open house.

One of Oregon's newest industries, the RT&E Corp. at Tigard, delivers part of its initial production of electric distribution transformers. Bill Birchall of the RT&E shipping department checks the bill of lading with Don Fairbanks, Portland General Electric Co., while RT&E and PGE officials look on. RT&E manufactures electrical distribution equipment in the 23,000-sq-ft plant located on a 6½-acre plot at 2600 S. W. Highway 217. The plant was started in October 1957 and recently went into production. Construction costs were $200,000, according to Clyde W. Shaw, RT&E vice-president and treasurer. The firm employs 35 workers and looks forward to an employment potential of some 125 workers with expansions. RT&E's home plant is in Waukesha, Wis.

► **Packard Bell Computer** Corp. has moved its Los Angeles office to 1905 Armacost Ave.

► Three showrooms have been added by **Agencies Co.,** 846 Traction Ave., Los Angeles. One 20x30-ft room and a 9x9-ft room will feature displays of all the manufacturers represented by Agencies, including Commercial Enclosed Fuse Co., Regal Mfg. Co., Wadsworth Electric Mfg. Co., Circle F Mfg. Co., Eliza Metal Products, Hatfield Wire & Cable, All-Steel Equipment Co., OZ Electric Mfg. Co. In addition, a third 9x9-ft showroom will be devoted entirely to the products of Anchor Mfg. Co.

► **James A. Twelves,** 50, formerly district manager of Graybar Electric Co. in Salt Lake City, and more recently in Dallas, died May 23. He was a native of Salt Lake City.

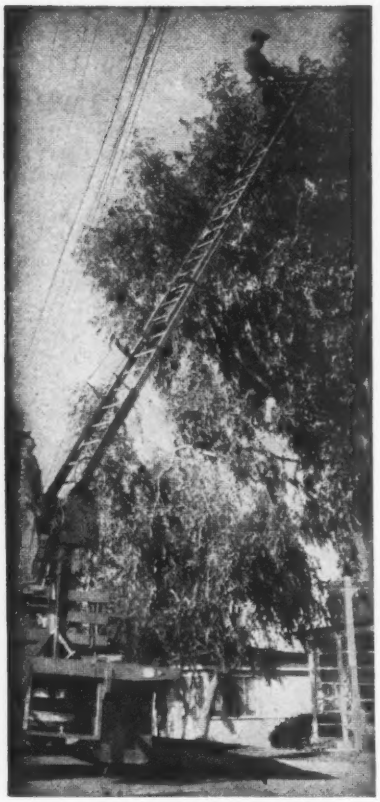
► Acquisition of **Airborne Instruments** Laboratory of Mineola, N. Y., by **Cutler-Hammer** has been approved by stockholders of both companies.

► With the company since 1956 as its factory representative, **John G. O'Donnell** has been named sales manager of the Electro Products Co. of Vancouver, Wash. The company manufacturers automatic electric baseboard heating units.

► **Milton A. Weiner,** formerly with Ruby Lighting, is now associated with Western Lighting of Los Angeles. Herb Moses and Louis Nussbaum are co-owners of Western Lighting, which is installing an electrostatic paint system and a Bonderizing system. The company will issue a 65-page condensed catalog.

► A new firm has been set up in Hollywood to handle DuMont's industrial TV line. **Kenneth K. Kaylor** and **Laurence J. Eaton** have incorporated under the firm name, Engitron, as an independent franchised distributor for the new line and will have exclusive rights for sales, installation and servicing in southern California.

► **Leonard L. Minthorne** Co., Portland representative of Continental Carbon Inc. and Alpha Wire, has started construction of a new office building at S. W. Macadam Avenue and Taylors Ferry Road.



SURGICAL LINE CLEARANCE BY DAVEY

Davey is doing line clearing for 12 Public Utilities on the Pacific Coast —most of them served continuously for over 20 years. Davey specialized equipment and efficient methods save money . . . Davey surgical pruning benefits trees—builds goodwill.

DAVEY LINE CLEARING
DIVISION OF
DAVEY TREE SURGERY CO., LTD. OF CALIFORNIA
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DAVEY ORIGINATORS OF TREE SURGERY

Signs along the lines of Crapo GALVANIZED STEEL STRAND PERFORMANCE

For dependable performance . . . insist upon Crapo Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes Crapo Steel Strand first choice for guys, messenger and overhead ground wire.

The famous Crapo galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.

INDIANA STEEL & WIRE CO. Crapo Galvanizing MUNCIE, IND.

- Low maintenance cost
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- Meets highest quality standards
- A size and grade for all practical needs
- Contact your Crapo Jobber Today!

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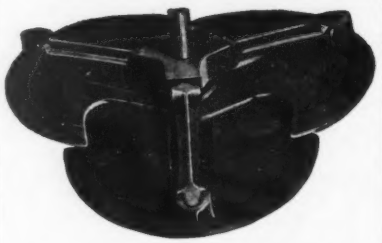
EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



EVERSTICK ANCHORS

For new construction and maintenance —Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resilient, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

People

► **Peter C. Spowart,** assistant superintendent of Seattle City Light, retired recently after nearly 47 years with the lighting department. Beginning in 1911 as a warehouse laborer, Spowart earned promotions to contract agent, senior contract agent, sales manager, and then in 1951 to assistant superintendent. He is currently serving in his second term as president of the Northwest Public Power Assn., and for a number of years has been a member of the American Public Power Assn. public relations committee, serving as chairman for three years.

Spowart

Puget Power Changes

In appointments announced by the Puget Sound Power & Light Co., John Tallman becomes general foreman of the company's new Factoria line and service headquarters and Grant Bull Jr., senior power dispatcher at Bellevue, moves to Spokane as an engineer and Puget's representative on the Intercompany Group Operations.

Tallman started with Puget as a lineman in 1927, has been a line foreman at Snoqualmie since 1950.

At Spokane, Bull replaces Dave Knight, supervisor of system operations, who has returned to Bellevue. Ed Van Winkle becomes senior power dispatcher while Clyde Simmons was named power dispatcher.

Emmet P. Kelly, formerly superintendent of the power supply division, was made safety director.

George L. Artus, superintendent of the Shuffleton steam plant, assumed the additional duties of power supply superintendent.

Joe T. Bradshaw, who had been safety engineer, was appointed general claim agent.

Clifford G. Johns was transferred to Bellevue from Bremerton to be asistant to Richard P. Mortell, assistant operating manager. He was an assistant superintendent for the Western division.

► **Clyde P. Elliott** has been appointed Rocky Mountain representative of Sterling Electric Motors Inc. of Los Angeles. Elliott's Denver address is 661 Delaware St.

Anderson

Selby

► **H. C. Anderson Jr.** has been promoted to assistant sales manager for Southern States Equipment Corp., and will move from Portland to Hampton, Ga. He has been with the company 12 years. Succeeding Anderson as Western district manager in Portland will be **Carl Selby,** who has been Anderson's assistant for the past year and a half. Selby was formerly with Portland General Electric Co.

► **John H. Watt,** formerly Seattle city electrical inspector and later associate engineer in charge of Seattle electrical inspection until 1954, then with Green Lake Electric Construction Co. in Seattle, was recently made assistant superintendent of the New York State Bureau of Electricity. He was president of the Puget Sound Chapter of IAEI and active in its code panels.

► **William B. Bustard,** formerly with Allen-Bradley Co., recently joined Kenneth J. Harrison to form the consulting engineering firm of Harrison & Bustard Consulting Engineers at 1814 N. Main St., Santa Ana.

► Resignation of **Bruce D. Watters,** who for the past six years has served as power use and education adviser for the Vigilante Electric Co-op in Dillon, Mont., was announced by manager H. L. Babcock. The position will be filled by **Byron Sanborn.**

Wheeler

Brennan

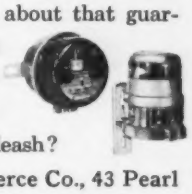
► James F. Brennan became manager and Ronald L. Wheeler accounting and office manager of Day-Brite of California's Santa Clara plant in appointments announced by Stanley M. Bixler, senior vice-president of the parent firm. Brennan was advanced from plant superintendent.

About the worst mess we ever got into happened a while ago, when an alarming number of our photoelectric street lighting controls began failing in the field. (Failing *off*, yet!) Needless to say, we kept hopping until we got to the bottom of the trouble.

The failures, for the most part, were finally traced to an elusive defect in one component. A "bad batch" of them had apparently gotten into the controls made in a certain period, causing them to fail left and right. Once *that* was discovered, this component was replaced in a hurry. In the process, we also revamped our own inspection and testing methods, and straightened out a few other home-grown problems as well. The odds are now pretty long against such wholesale trouble ever happening again.

Our customers concerned got a full report of what was going on and what we were doing about it. They were asked to ship back to us all the controls and stocks of the bad component date coded for that period, plus *any* future failures they felt were chargeable to this earlier trouble. All expenses for this were our problem, not the customer's. Although this went a couple of miles beyond our regular warranty, it was our idea of what should be done.

Well, so much for the Troubles We've Seen. The moral is—a guarantee is a lot *more* than words printed on a piece of paper. How would you feel about that guaranteed product shown above—if you couldn't depend on the leash?



The Fisher-Pierce Co., 43 Pearl St., So. Braintree 85, Mass.

FP

FISHER PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

► **W. J. Satre** has been promoted to the new position of construction and maintenance manager for Washington Water Power Co. He now heads up a new department for WWP, and will be assisted by **G. R. George,** assistant manager; **R. C. Kelly,** who is contract construction and maintenance superintendent; and **C. Knostman,** who is now chief clerk for construction and maintenance.

Satre

► **D. J. Reed** is appointed electrical design engineer, engineering staff, Western Mining Divisions, Kennecott Copper Corp. He is an electrical engineering graduate of the University of Alabama.

► **L. A. Peterson** has been appointed district operating manager at Seattle for Graybar Electric Co. Inc. He comes West from Jackson, Miss., where he has been a branch manager.

► **Clifford A. Erdahl** has resigned as chairman of the Pacific Northwest Utilities Conference Committee to become a candidate for Congress. He has been chairman of the committee since helping to organize it 12 years ago.

► **A. Clifford Tyler** has the newly created position of director of commercial activities for Seattle City Light. In his 23 years with the commercial division, he has served as junior clerk, electric appliance salesman, contract agent and senior contract agent. He was named commercial manager in 1954. Tyler is a native of Seattle, and attended both the University of Washington and Washington State College.

Tyler

► **Joseph Y. De Young** has been named electric superintendent of the Fresno district of Pacific Gas and Electric Co. De Young has been with PG and E since 1941. He is a graduate of Fresno State College, and has served as a substation engineer and then distribution engineer with the company.

► **Dr. Chauncey Starr,** vice-president of North American Aviation Inc. and general manager of Atomics International Division, was elected president of the American Nuclear Society at the organization's annual meeting in Los Angeles recently.

► **Wilson A. Pritchett** has been appointed chief engineer of Knopp Inc., Oakland, manufacturer of precision electrical testing equipment. Pritchett has an MS degree in electrical engineering from Oregon State College, and has for the past 10 years been a professor in electrical engineering at the University of California, Berkeley. Pritchett is a member of the IRE, AIEE, ISA and NSPE.

Pritchett

► **Jack L. Quisenberry** has been appointed advertising and sales promotion manager for Sierra Electric Corp., Gardena, Calif. As part of his new responsibilities, Quisenberry will also act as assistant sales manager. He formerly held a similar position with Emerson-Pryne Co., Pomona manufacturer of recessed lighting equipment.

Quisenberry

► **Wayne M. Bitting,** sales manager for Mullenbach Division of Electric Machinery Mfg. Co., has been promoted to general manager of the electrical equipment department. He has been with the company since May 1946.

► **W. H. Huffman** has been named manager of houseware sales of Graybar Electric Co., Los Angeles district, and **W. W. Bonnet** has been appointed district appliance sales manager. Bonnet succeeds **D. H. Capelli,** who retired July 1.

► **Bill Stewart** has returned to Smoot-Holman, Los Angeles, to resume his duties as architects' and contractors' contact man. In the year and a half since leaving Smoot-Holman, he has operated his own electrical wholesale distributing business in Lancaster, Calif.

► **Ray Hoidal** has been appointed chief civil engineer in charge of the project engineering section of Seattle City Light. He replaces **Charles E. Shevling,** who retired recently. Hoidal has been with City Light since 1946, and is a civil engineering graduate from the University of Idaho and a licensed professional civil and structural engineer in the State of Washington. Hoidal has worked as an engineer with the Bureau of Reclamation, the Panama Canal Zone Municipal Engineering Department, the Puget Sound Navy Yard and Tacoma City Light.

Hoidal

► **Phillip L. Cole** has been named resident engineer at the Corps of Engineers Hills Creek Dam project on the Middle Fork Willamette River.

► **Will C. Hall,** formerly president of Pacific Coast Engineering, Alameda, Calif., has been elected president, general manager and a member of the board of directors of Moffett Engineering Inc., Albany, Calif.

► **Elmer Harris** has taken over a new assignment as Casper district line superintendent for Pacific Power & Light Co. and **Porter Davis** has been named his assistant.

► **H. R. Waldo,** former president of Telluride Power Co., has been elected a director of Utah Power & Light Co. He continues as vice-president and treasurer of Utah Power.

► **Neil W. Plath** has rejoined Sierra Pacific Power Co., Reno, as assistant general superintendent. For the past nine years he has been with Stone & Webster Corp., New York, serving in a management consultant capacity. He was originally with the utility from 1936 until 1949, except for four years' military service.

► Western Colorado Power Co. has made new appointments at Durango and Montrose. **William D. Weller,** a company employee since 1939, was made district representative and **James V. Standley,** district foreman, at Durango. **Clair J. Hadley** was named Montrose district representative.

3-Way Lighting Merchandiser

Available NOW Thru Virden Distributors

It's a smart attractive wall display — Here, two 48 x 33" units make one 96 x 33" wall display. Accommodates up to 22 Virden wall fixtures. To extend it, just add more units.

Add a ceiling now or later — Here two 48 x 54" ceiling units are chain-suspended from the ceiling, will accommodate up to 26 Virden fixtures. Excellent for use in smaller rooms or where floor space is limited.

Add legs — and you have a free-standing display! Now it's a complete lighting center! Displays up to 48 Virden fixtures. Makes selection (and buying) easier, faster.

Packed complete! Shipped to you prepaid!

It's a brand new concept in lighting fixture display! Modular units, designed by Virden, to answer almost every conceivable display problem, to fit any shape room. You can use it singly, or multiples, around corners, in squares, oblongs, literally dozens of combinations. You can suspend it from the ceiling, hang it from the wall, or use it with legs for a free-standing unit.

Smart in appearance, ruggedly made, it displays Virden fixtures perfectly, makes selling easier, faster, more profitable. Each unit is prewired with Bulldog Electrostrip. Metal panels in pastel colors are adjustable, slip out for easy fixture installation.

A colorful brochure, picturing and explaining this new merchandiser in detail, is available. See your Virden distributor or write John C. Virden Company, Marketing Division, Dept. EW, 5209 Euclid Avenue, Cleveland 3, Ohio.

VIRDEN Lighting

virden

Member American Home Lighting Institute

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► **Eugene F. Machell** has been selected to direct Pacific Power & Light activities related to chemical processes. An immediate project will be a research program for the development of possible by-products of subbituminous coal from deposits the electric utility is developing for generating plant fuel in Wyoming. Machell was formerly production manager for petroleum-gas and by-products of Portland Gas & Coke Co.

► **A. D. Ray** and **Andy Prunella** have been appointed representatives for Electro Lighting Corp. in the Texas and New Mexico territories. The men will work for Traweek-Healy & Associates, who have offices in Houston, Dallas and Lubbock, Tex.

► **James H. Drake** has been appointed superintendent of system operation for Southern California Edison Co. A recent nominee for Eta Kappa Nu Assn.'s title of "outstanding young electrical engineer," Drake has been with the Edison Co. for nine years. Drake holds both bachelor's and master's degrees from the California Institute of Technology.

► **E. K. Murray,** former city attorney and special counsel for Tacoma City Light on the Cowlitz case, has been appointed to the utility board.

► **George T. Howard** is the new engineering representative in the Pacific Northwest for Kliegl Bros., manufacturer of architectural, school and stage lighting equipment. He will headquarter in the American Bank Building, Room 1127, Portland 5, Ore.

► H. Leslie Hoffman, president of Hofman Electronics, Los Angeles, received the electronics industry's 1958 Medal of Honor at a dinner May 22 in Chicago. The award was presented by Paul V. Galvin, a past president of EIA, which makes the award.

► **Robert W. Bergen** is now director of public relations at Hoffman Electronics Corp. in Los Angeles.

► Pacific Power & Light Co. has appointed **Eugene F. Machell** as chief chemical engineer. Formerly production manager for petroleum-gas and by-products for Portland Gas & Coke Co., Machell will direct PP&L activities related to chemical processes, according to George L. Beard, assistant chief engineer. An immediate project will be a research program for possible by-products of subbituminous coal from deposits being developed for generating plant fuel in Wyoming.

► **Charles McDowell** has been promoted to assistant superintendent of Pacific Power & Light's Kalispell, Mont., district.

► **Warren A. Petersen** is now Western regional marketing manager for Paragon Electric Co. He will supervise all sales activities in the Intermountain and West Coast areas from Los Angeles headquarters at 429 S. Western Ave.

► **Daniel Rashall,** formerly with Sunbeam Lighting Co., has become sales promotion manager of Nu-Lite Fluorescent Mfg. Co. Inc., 1212 S. Olive St., Los Angeles.

► **Bruce Callahan** is a new salesman with Century Electric Co. in the San Francisco branch office.

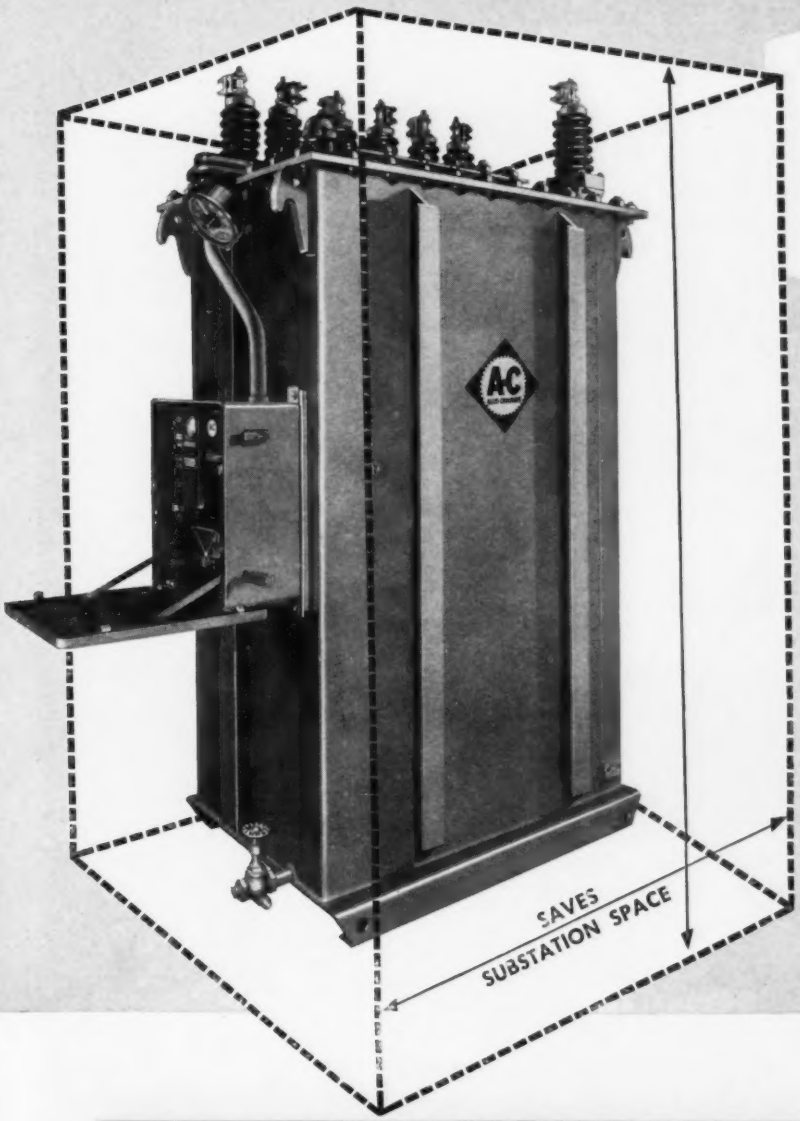
► **Ralph W. May** has been named district manager for microwave sales for G-E's communications products department at Redwood City, Calif.

► **William C. Miles** has been appointed to the newly created position of manager of the builder sales division at the Leo J. Meyberg Co., San Francisco, RCA-Whirlpool distributor in northern and central California and Nevada. He will assist in designing custom kitchens for consumers as well as handling sale of appliances to builders.

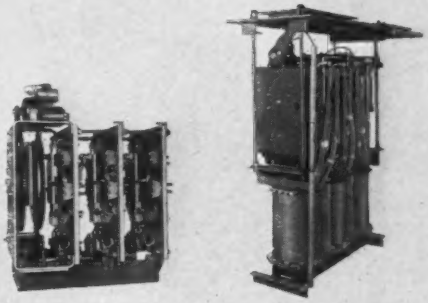
► **Joe A. Marine** was made sales supervisor of the Boise division, Westinghouse Appliance Sales Co., succeeding **F. T. Stevens,** who resigned.

► **Henry Ferd Koch,** owner of Electric Service Co. in Boise, was unanimously appointed a member of the Boise city council to fill an unexpired term. Koch has been prominent both in the electrical industry and civic circles in southern Idaho. A graduate of University of Idaho, 1934, as electrical engineer, he worked for Idaho Power Co. 1934 to '41. He ended army service as lieutenant colonel and started Electric Service Co. in 1945, later acquiring Terry Appliance, Village Appliance, Oakley's Appliance and setting up Electric Service Finance Co. He is a past president of the Snake River Valley Electrical Assn. and chairman of the Idaho State Electrical Board.

Allis-Chalmers—25 years of leadership in 5/8% regulators



NOW save 33% space... 30% cost



Illustrations show heavy-duty tap-changing mechanism and unit construction combined with new space-saving arrangement of tap-changing mechanism.

NEW Allis-Chalmers 3-phase distribution regulators

Get these new benefits only with Allis-Chalmers new 3-phase distribution regulators:

- 33% less space required for distribution regulators in substation.
- 20% less weight for easier handling, lower installation costs than ever before.
- 30% less cost per kva of 3-phase regulation.
- 160% *Vari-Amp* rating is now provided to 600 ampere maximum.

Available in most popular ratings as follows: 500 and 750 kva, 8660 v; and 500, 750 and 1000 kva, 13,200 v.

The important savings offered by these new units warrant re-evaluation of your present substation planning.

Check with your nearby A-C office or contact Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Originators of 5/8% Step Regulators

ALLIS-CHALMERS

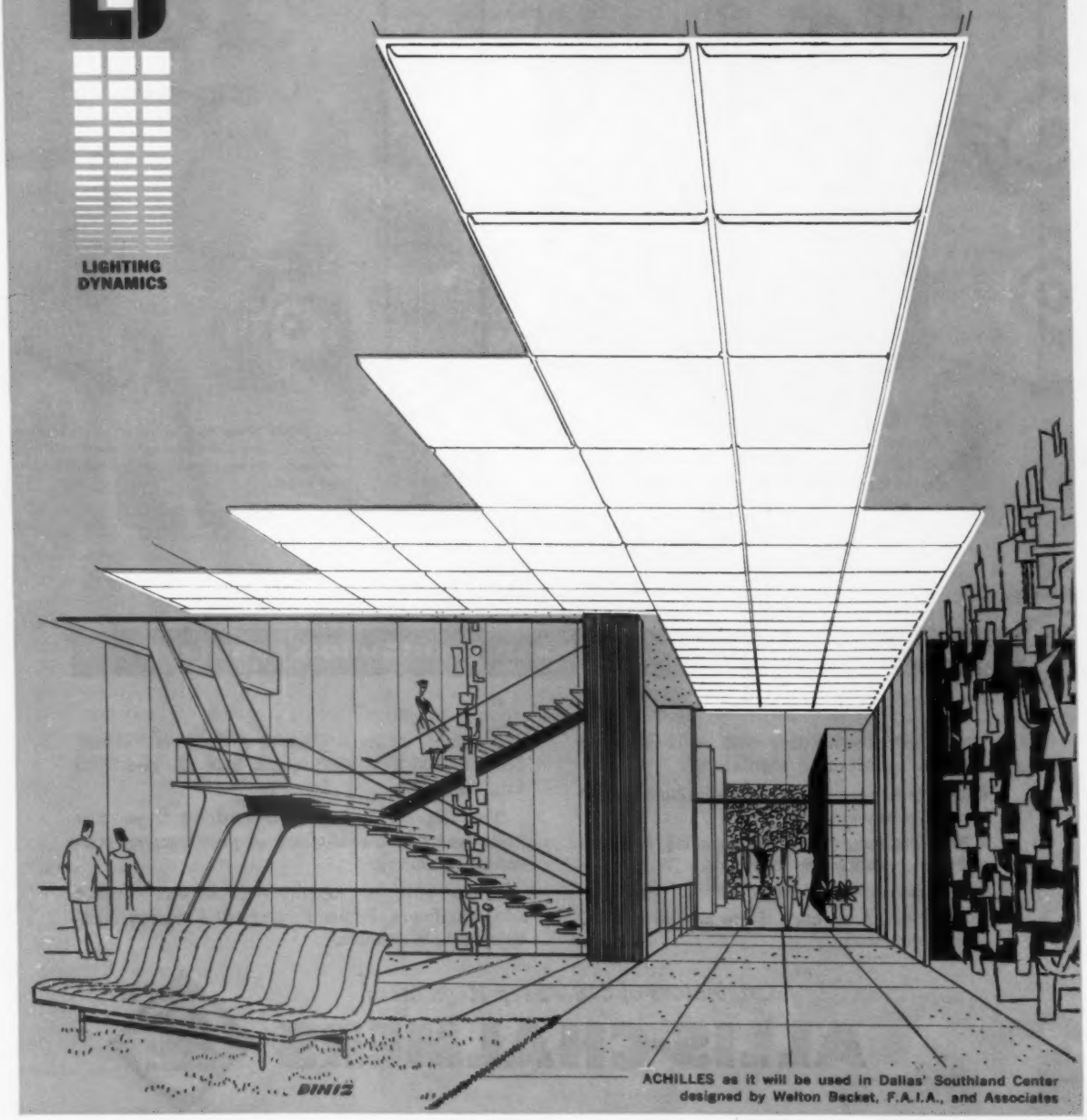
A-5768

problem solution

An easily maintained, integrated fixture was needed for Welton Becket's dramatic "squares of light" ceiling in the lobbies and offices of Southland Life's spectacular 42-story Southland Center in Dallas.

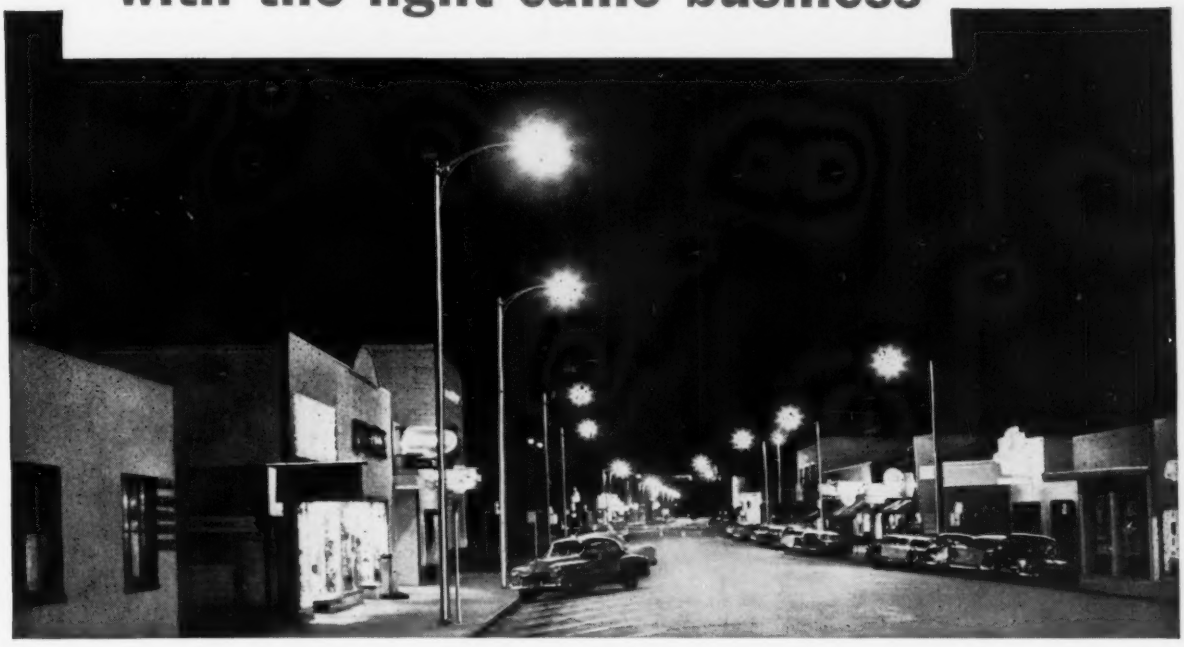
ACHILLES by Lighting Dynamics was specified for the lobby . . . and it's companion Apollo was used in the offices throughout the center. Achilles is a highly versatile fixture series ideal for this demountable acoustical ceiling—just as it is for countless other ceiling suspension systems. It's quickly installed with a drop-in installation and has easy maintenance with press-to-open catches and hook-on hinges. Durable, Bonderized and electro-static, high-reflectance finishes . . . FOR MORE COMPLETE INFORMATION, call your Lighting Dynamics representative, or write to Lighting Dynamics, 802 West Whittier Blvd., Whittier, California or Lighting Dynamics, 8700 Ambassador Row, Dallas, Texas.

LIGHTING DYNAMICS



ACHILLES as it will be used in Dallas' Southland Center designed by Welton Becket, F.A.I.A., and Associates

with the light came business



When Novato turned on its new Mercury Street Lamps, the community saw more cars pulling off the freeway into town... more towns-people stepping out after dark...fewer accidents and a big boost in civic pride.

This could be your town with *Modern Street Lighting.* Interested?

For a free lighting survey, contact your local P. G. and E. office. You can also obtain the free booklet "Modern Street Lighting for YOUR Community." You'll read how to bring your town the bright, safe, friendly streets you like.

P·G and E· *Pacific Gas and Electric Company*

Peag*

A peag is not a south-of-the-border hog! It has nothing to do with bacon, ham or sausage on the hoof. Or even a sow's ear. But you can put it in a silk purse because it means wampum or money!

If you want to earn more peag and eat higher on the hog, take advantage of your electric industry's national "Live Better . . . Electrically" and "Full HOUSEPOWER" promotions. These outstandingly successful campaigns were designed to help you sell better and to encourage your customers to buy better.

Remember . . . you'll get out of these industry-wide promotions just what you put into them. So what'll it be? Your full merchandising effort and lots of peag? Or minimum effort and a pig in a poke?

You're the boss! For complete details on these and other PCEA activities, drop by or write either of our offices.

PACIFIC COAST ELECTRICAL ASSOCIATION

530 West Sixth Street, Los Angeles 14, California • 681 Market Street, San Francisco 5, California

* Peag (peeg), n. wampum. Webster's New Collegiate Dictionary, 1956 edition, p. 618.